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A Unusual Case Of Bifid Mandibular Canal In Down Syndrome Patient – An Accidental Finding

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Abstract: Bifid mandibular canals are anatomical variations in the mandible. They are often unrecognised in the radiographic assessment. Presence of bifid mandibular canals can pose various complications during any surgical procedures in mandible which includes extraction of mandibular molars, implant placements and any other surgery of mandible. Also sometimes an extra mandibular canal may be a cause of inadequate anaesthesia during surgical procedures. Thus it is important to detect these anatomical variations through radiographic assessment and give special attention during the treatment protocol. On the other hand , Down syndrome is a common genetic disorder, which is characterized by the presence of an extra copy of chromosome 21 (trisomy 21). There have been various craniofacial features and dental anomalies recorded in Down syndrome but the presence of bifid mandibular canal have not been recorded in these patients. Hereby, we record a case of Down syndrome patient with the presence of bifid mandibular canal.

Keywords: Bifid mandibular canal, Down syndrome, Anatomical variation, Panoramic radiograph, Foramen.

1. INTRODUCTION

The mandibular canal (MC) which is sometimes also called as inferior nerve canal, is a prominent anatomical structure of the mandible. This canal passes from mandibular foramen to the mental foramen and it transmits inferior alveolar artery and inferior alveolar nerve (IAN) , a branch of third division of the trigeminal nerve. Dental and incisive branches leave the inferior alveolar nerve within the canal to supply all the mandibular teeth and its adjacent structures such as lower lip, chin, and soft tissues anterior to mental foramen. Within the canal, the alveolar nerve is approximately 4 mm in thickness.[1] One of the unusual and interesting anatomical variations that we may come across in the mandible is bifid mandibular canals (BMCs) which can lead to difficulties during performing mandibular anaesthesia or extraction of mandibular third molar, placement of implants, and surgery.[2]. " Bifid " is a term derived from latin word which means a cleft dividing into two branches or two parts. Among various anatomical variations of mandible, Bifid Mandibular Canals (BMCs) is a variation that sometimes get un-noticed by the dental practitioners. These canals originate at the mandibular foramen and may have neuromuscular bundle for each. Reports suggest that the possible cause of the formation of these bifid mandibular canals are incomplete fusion of the inferior dental nerves during embryogenesis. The presence of these anatomic structures has its significant clinical implications. Awareness and knowledge about these mandibular canal variations help to prevent complications that may arise due to damage of the BMC during any surgical procedure.[3] There are several complications that can occur due to BMCs such as traumatic neuroma, paraesthesia, anaesthesia and bleeding are all possible complications.[4]. The existence of these bifid mandibular canals can be appreciated by anatomical studies or by radiographic studies and it has been reported in various radiographic studies such as Orthopantomogram (OPG), Computed Tomography (CT), Cone Beam Computed Tomography (CBCT) with the occurrence rate of 0.08% to 0.95%. One of the panoramic radiographic study reported that the incidence of this BMCs has been variably reported as 0.4%, 0.08%, and 0.9%.[5] In contrast to panoramic radiograph, computed tomography and cone-beam computed tomography allows 3-dimensional insights of the canal but with the disadvantage of being costly and higher radiation. There are various types/patterns of mandibular canals. Historic classifications of BMCs has been proposed by Nortje in the year 1977 and another classification by Langlais in the year 1985 (Table I). Both the classification described the distinctive variations of BMCs large enough to be detected with panoramic radiographs. The most recent classification of BMCs using CBCT was suggested by Luangchana in the year 2019 (Table 1).

TABLE 1 : CLASSIFICATION OF BIFID MANDIBULAR CANALS

AUTHORS	TYPES	DEFINITION
Nortje (1977)	Type I (most common)	Two canals originating from single mandibular foramen, usually of same size
	Type Ia	The lower canal is sometimes smaller
	Type Ib	The upper canal is the smallest of the two canals
	Type II	Short upper canal extending to 2nd or 3rd molar
	Type III (least common)	Two canals originating from two mandibular foramina, but joining together in the molar region to form one canal
	Type IV	Is a double-canal variation in which the supplemental canals arise from the retromolar pad area and join the main canals in the retromolar areas.
Langlais (1985)	Type I	Represents unilateral or bilateral bifid canals that extend to the mandibular third molar area or the immediately surrounding area

	Type 2	Includes unilateral or bilateral bifid canals that rejoin within the ramus of the mandible
	Type 3	It is a combination of types 1 and 2
	Type 4	Two canals, each of which originates from a separate mandibular foramen, join to form one larger canal
Luangchana (2019)	Type A	Superior type: single or multiple canals branching superiorly from the main MC
	Type B	Forward type: BMC coursing forward and running lower than apices of teeth (B1 not merging, B2 merging with MC)
	Type C	Plexus type: branching plexus from MC
	Type D	Anterior extension type: branching from mandibular incisive canal (D1 single or series of canals; D2 plexus of canals)

Bifid mandibular canal is an anatomical variation that has been reported to occur in various population in normal patients or patients with any other co-morbidities but till date no literature has recorded its occurrence in down syndrome patient. The purpose of this case report is to present an accidental finding of Bifid mandibular canal in a patient with down syndrome.

2. CASE REPORT

A 35-year old female patient who had Down syndrome reported to the dental OPD with the complaint of missing tooth in upper and lower arch and removal of the cap in upper front tooth region and wants replacement. The patient had moderate mental retardation but was able to understand, communicate and respond to us. No other systemic complications were reported. Dental history reveals prosthetic treatment and root canal treatment 5 years back. Family history revealed that mother was diabetic and no other family members and relatives were affected with Down syndrome.adverse habits revealed tongue thrusting habit and mouth breathing habit. On extra-oral examination, the patient had brachycephalic skull, slanting palpebral fissure, depressed flat nasal bridge, hypertelorism, short neck, clinodactyly, skeletal class III, and lip incompetence. On intra-oral examination, patient had poor oral hygiene, dental plaque and calculus, multiple missing tooth in relation to 11,12,13,27,31,32,33,41,42,43,44,45, dislodged fixed prosthesis in 21,62,63 (retained deciduous - 62,63), dental caries in 26, 37, generalised bleeding on probing with inflammation of gingiva and loss of attachment, grade I mobility in 25,26,34,35 and grade I mobility in 24,25, enlarged tongue with a small growth on the right lateral surface of the tongue measuring upto 2x2mm and high arched palate. Provisional diagnosis was given as Partially edentulous in relation to 11,12,13,27,31,32,33,41,42,43,44,45 and Dislodged fixed prosthesis in relation to 21,62,63. Other diagnosis included Dental caries in 26, 37, Macroglossia, Fibroma on right lateral surface of tongue, Generalised chronic periodontitis, Malocclusion . (Figure 1)

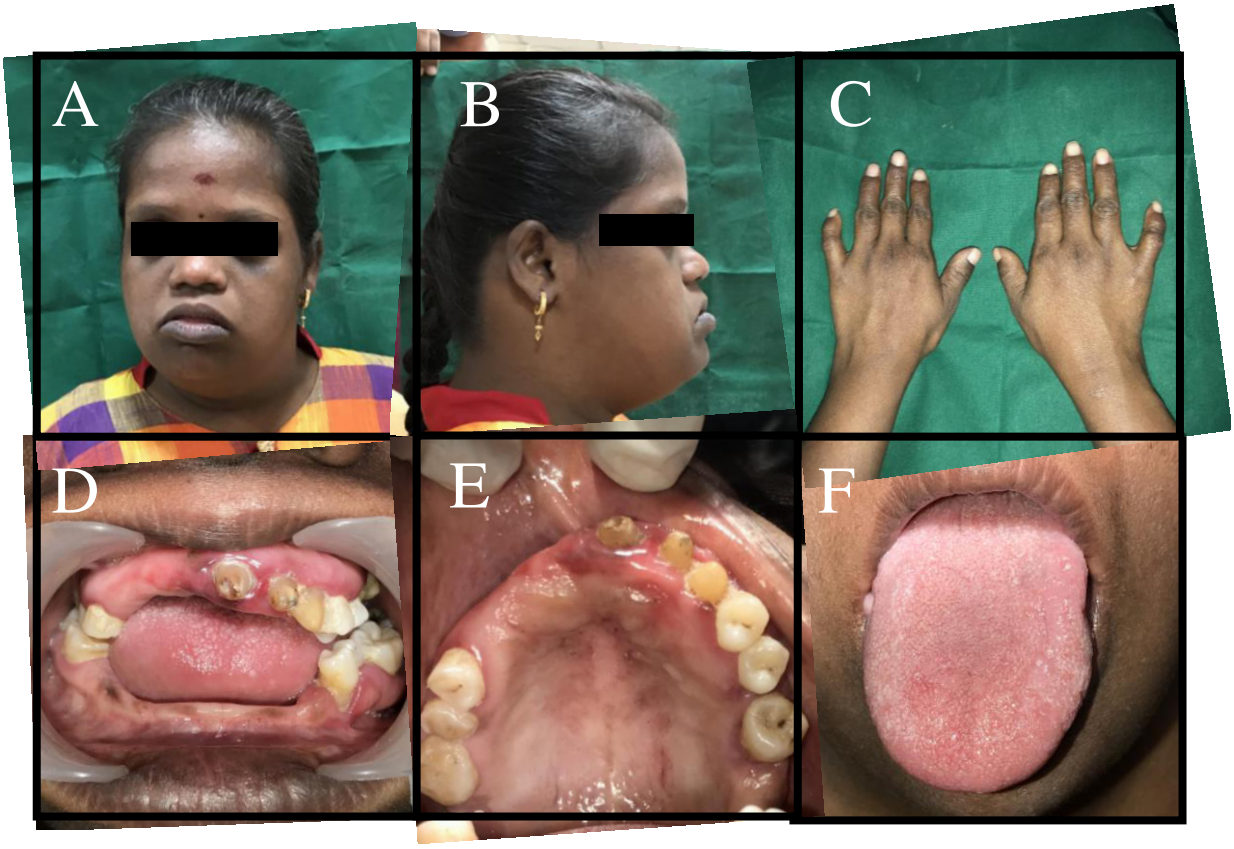

Fig 1 : 1A and 1B - front and side profile picture , 1C - left and right hands showing clinodactyly , 1D - Intraoral frontal picture, 1E - high arched palate, 1F - Macroglossia with fibroma on right lateral surface of tongue.

2.1 Radiographic Interpretation

On the routine investigation, patient was advised to take a panoramic radiograph for radiographic assessment which revealed multiple edentulous space in upper and lower arch, retained deciduous in relation to 62,63 with root resorption in 62, impacted 23, generalised horizontal bone loss suggesting generalised chronic periodontitis, saddle shaped mandible. The radiograph also revealed an anatomical variation of bifurcation of mandibular canal on left and right side. On the left side, two mandibular canals were observed which joins in the molar region and continues as single canal. On the right side, it reveals two mandibular canals which extends till the mental foramen as separate canals with branching of canal at the region of retromolar region. (Figure 2)

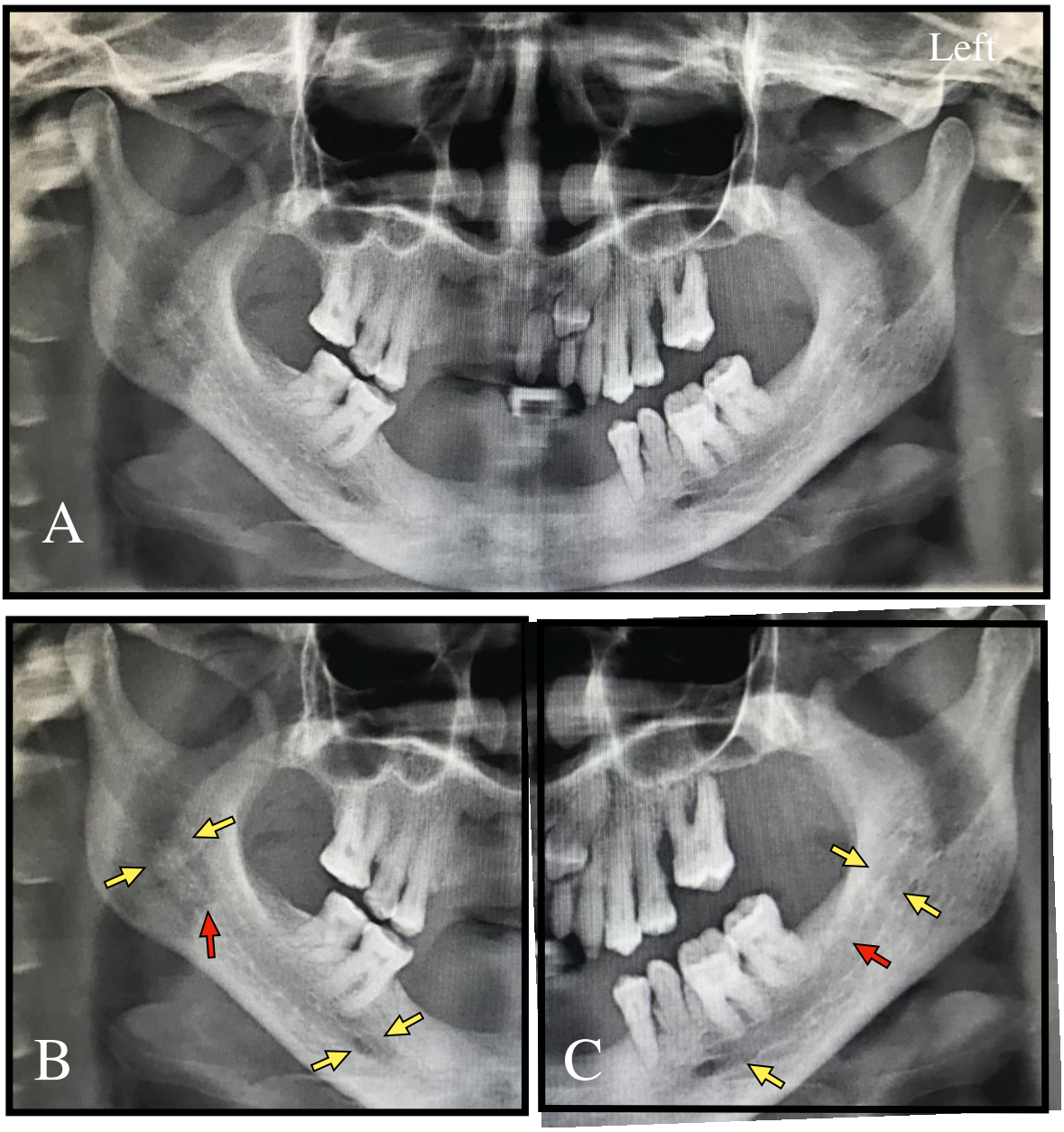

Figure 2 : Panoramic Radiograph , 2A - OPG reveals Bifid Mandibular Canals (BMCs) bilaterally, multiple partially edentulous space, impacted 23, retained deciduous 62,63, Generalised chronic periodontitis, 2B - yellow arrow shows right side BMC extending till mental foramen with branching at retromolar region shown by red arrow, 2C- yellow arrow shows left side BMC which extends till the third molar region and joins to form a single canal which is shown by red arrow.

3. MANAGEMENT

The patient was informed about the importance about the condition and advised to take a CBCT but the patient was unaffordable. Hence to continue with the management, patient was referred for surgical removal of the retained deciduous (62,63) and the impacted tooth (23) under local anaesthesia followed by prosthodontic replacement of edentulous space.

4. DISCUSSION

Mandibular canal protects an important neuro-vascular bundle responsible for carrying blood supply and sensitive activity to the lower teeth, lower lip, adjacent bone, gingiva and mucosa . Analysing the accurate position and the course of the mandibular canals and proper identification of its anatomical variations such as bifid mandibular canals (BMCs) , trifid canals or additional foramen, is essential at the time of surgical procedures of mandible for prevention of potential complications. It is also reported that presence of BMCs can cause inadequate anaesthesia. Various literature studies reveal that occurrence of bifid mandibular canals are unusual but are not rare. Such anatomical variations are reported in various population based on age, gender, races, geographic distribution but there are no evidence of its occurrence reported in down syndrome patient. Down syndrome (DS) is a condition with intellectual disability and congenital heart disease and is a well-known disorder caused by an extra chromosome 21. Patients with Down syndrome face many health issues such as health issues including learning and memory, congenital heart diseases (CHD), Alzheimer's diseases (AD), leukaemia, cancers and Hirschsprung disease(HD),[8,9] DS individual have variety of physical characteristics like a small chin, slanted palpebral fissure , poor muscle tone, a flat nasal bridge, simian crease (single crease of the palm) , and oral features may include protruding tooth due to small mouth and macroglossia, gingivitis or periodontitis, microdontia, hypodontia, anterior open bite and high arched palate. Other features includes big toe, abnormal pattern of fingerprint and short fingers with clinodactyly.[10] Various radiographic assessments have been recorded in these patient for other systemic illness but only fewer literature have recorded on oral radiographic features in DS individuals. The purpose of this case report is to record one such unusual anatomical variation related to oral cavity in Down syndrome individual. Bifid mandibular canals has been proposed as one among the possible reasons for failure of mandibular anaesthesia technique for inferior alveolar nerve block and sometimes can also cause complications like traumatic neuroma, paresthesia, bleeding, hepatoma etc. Few radiographic study which assessed concomitant panoramic radiographs of patients with BMCs detected in CBCT and reported that 7.1% of BMCs were visible in panoramic views. However the studies concluded that CBCT is the reliable method for confirmation of the BMCs. But due to the cost and comparative high radiation exposure, CBCT cannot be used routinely for treatment planning for all the patients. Thus panoramic radiographs are used for routine dental radiographic assessment to assess such anatomic variations and if BMCs are suspected and not clearly visible in panoramic radiograph then CBCT maybe advised for three-dimensional evaluation and identification before any surgical procedures to avoid operative complications. In our case, based on the Nortje classification, it was found to be type III on left side (the least common type) and type I on right side. Based on Langlais classification, it was type III which is a combination of type I and type II. Based on classification, it was type B2 on left side and type A on left side. The patient was advised to take CBCT but was not affordable. Hence patient and her guardian was given adequate awareness about the condition and referred for further management to the respective department with a consent to take CBCT if required.

5. CONCLUSION

To conclude, Bifid mandibular canal is an unusual accidental radiographic finding that can often go un-recognised by general dental practitioners. The clinical relevance of this article is to remind the clinicians about the anatomy of the variation of the mandibular canal, its complications and the required assessment. This case report serves as the first evidence of the incidence of bifid mandibular canal in a Down syndrome individual and also highlights the incidence of the least common type of Bifid Mandibular Canal (Type III of Nortje classification).

6. CONFLICT OF INTEREST

Conflict of interest declared none.

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