

Evaluation of the prevalence of bifid mandibular condyle detected on digital panoramic radiographs in North Karnataka region

Pragati K. Kempwade¹, Swetha Kattimani¹, D. N. S. V. Ramesh¹, Amit Byatnal¹, Amruta Bansode², Karishma K. Mujawar³

¹Department of Oral Medicine and Radiology, AME's Dental College and Hospital, Raichur, Karnataka, India, ²Department of Oral Medicine and Radiology, Chhatrapati Shahu Maharaj Shikshan Sanstha Dental College and Hospital, Aurangabad, Maharashtra, India, ³Department of Conservative and Endodontics, Tatyasaheb Kore Dental College and Hospital, Kolhapur Maharashtra, India

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Correspondence:

Dr. Pragati K. Kempwade, Department of Oral Medicine and Radiology, AME's Dental College and Hospital, Raichur, Karnataka, India. Mobile: +91-8605785830. E-mail: drpragatikempwade@gmail.com

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Abstract

Aim: The aim of this study was to determine the prevalence of bifid condyle using digital panoramic radiographs and to evaluate correlation of bifid condyle with gender.

Materials and Methods: Retrospective records of 1000 panoramic radiographs which were taken for their own diagnostic or treatment purpose in the Department of Oral Medicine and Radiology were evaluated by observer.

Results: Among the 1000 radiographs studied, bifid condyles were found in 60 radiographs, giving an overall prevalence of bifid condyles as 6%. Among the population studied, 28 (2.8%) had unilateral bifid condyle and 32 (3.2%) had bilateral bifid condyle. There was no statistically significant difference in the prevalence of bifid condyles in males compared to females.

Conclusion: The frequency of bifid condyle is higher in the North Karnataka population than previous studies. It is possible that bifid condyle is a more frequent condition that is commonly perceived. As it is asymptomatic condition, it usually remains incidental finding.

Introduction

The temporomandibular joint (TMJ) is a complex joint which plays an important role in normal functioning of the jaw. There are many causes of various unilateral and bilateral growth disturbances of the mandibular condyle and its related structures.^[1] A duplicated or lobulated mandibular condyle is known as bifid condyle characterized by partial or complete separation of condyle into lateral and medial halves. It is a rare condition.^[2] It was first reported on dried specimens by Hrdlicka in 1941.^[3] The exact etiology is uncertain, but circumstances such as trauma, teratogenic drug use, genetic tendency, infection, and exposure to radiation have been identified as possible causes for bifid condyle.^[4,5] Bifid condyle can be associated with symptoms, which are, however, may be asymptomatic. It is frequently discovered in routine radiographic examination such as panoramic radiography or during the investigation of other problems.^[6]

However, due to lack of epidemiological data, there is no enough information to determine the true frequency

and characteristics of this morphological variation and its association with the clinical conditions. The goal of this study was to determine the prevalence of bifid condyle using digital panoramic radiographs and to evaluate correlation of bifid condyle with gender using panoramic radiographic techniques in a North Karnataka population.

Materials and Methods

The study was approved by the ethical committee. Retrospective records of panoramic radiographs of 1000 patients were taken, who had been radiographed in the Department of Oral Medicine and Radiology from January 2019 for their own diagnostic or treatment purpose. These images were taken as part of routine examination, diagnosis, and treatment planning of patients. The radiographs of good contrast and density were included. Radiographs which were with errors, poor quality, and poor diagnostic value were excluded. Radiographs were evaluated for the presence or absence of bifid condyle. Statistical analysis was

done using SPSS software version 16. Analyzed data presented in suitable tabular form. Chi-square test used for comparing the proportions. $P < 0.05$ was considered as statistically significant.

Results

A total of 1000 radiographs of the persons aged 20–70 years were studied. Among the radiographs studied, bifid condyles were found in 60 radiographs, giving an overall prevalence of bifid condyles as 6%. Among the 536 females studied, 30 (5.6%) had bifid condyle, and among 464 males studied, 30 had bifid condyles (6.5%) [Figures 1 and 2]. The bifid condyle ratio was slightly more in males as seen through gender ratio of 1.16:1. There was no statistically significant difference in the prevalence of bifid condyles in males compared to females [Table 1].

Among the population studied, 28 (2.8%) had unilateral bifid condyle and 32 (3.2%) had bilateral bifid condyle. Among 28 persons with unilateral bifid condyle, 8 (0.8%) were on the right side [Figure 3] and 20 (2%) were on the left side [Figure 4 and Table 2].

There was no statistically significant difference in the prevalence of right-sided bifid condyles among males (4, 0.9%)

Table 1: Prevalence among males and females

Gender	Bifid condyle (%)		Total (%)	P value
	Not present	Present		
Female	506 (94.4)	30 (5.6)	536 (100.0)	0.564
Male	434 (93.5)	30 (6.5)	464 (100.0)	
Total	940 (94.0)	60 (6.0)	1000 (100.0)	

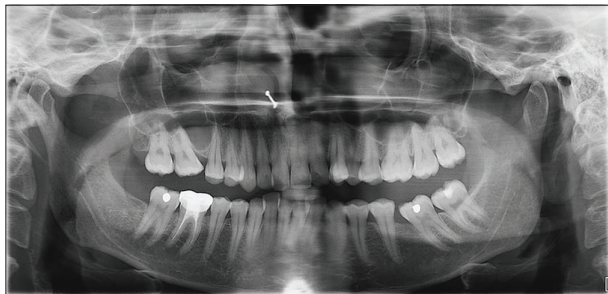


Figure 1: Panoramic radiograph shows bilateral bifid condyle



Figure 2: Panoramic radiograph shows bilateral bifid condyle

compared to females (4, 0.7%). There was no statistically significant difference in prevalence of left-sided bifid condyles among males (7, 1.5%) compared to females (13, 2.4%). There was no statistically significant difference in prevalence of bilateral bifid condyles among males (19, 4.1%) compared to females (13, 2.4%) [Table 3].

Discussion

Bifid condyle is relatively uncommon condition compared to other TMJ anomalies. Due to asymptomatic nature of condition, it is usually diagnosed accidentally during routine radiographic examination. The panoramic radiographic technique is widely used, affordable, and easily accessible to patient.

The term “bifid” is derived from the Latin word meaning “cleft into two parts.”^[7,8] First-ever study to detect bifid mandibular condyle (BMC) was done by Hrdlicka on dry human skull (1941).^[3] Sahman *et al.* (2011)^[9] also conducted a retrospective study evaluating panoramic radiographs of 18,798 patients resulting that 98 patients (0.52%) were found to have BMC. Kaur and Padda (2017)^[10] conducted a retrospective study of 800 extraoral radiographs, in which bifid condyles were found in 28, giving an overall prevalence of 3.5%. Haghnegahdar *et al.* (2014)^[11] conducted a study in a selected population in Iran by employing 1000 dental panoramic views. A total of 35 (3.5%) cases of bifid condyles were detected. Our findings are slightly higher than these results as we found prevalence of bifid condyle is 60 (6%). Based on results, it may be suggested that prevalence of bifid condyle is higher in this region.



Figure 3: Panoramic radiograph shows bifid condyle on the right side



Figure 4: Panoramic radiograph shows bifid condyle on the left side

Table 2: Prevalence of bifid condyle based on side involved

Bifid condyle	Frequency	Percent
Right side bifid	8	0.8
Left side bifid	20	2.0
Bilateral bifid	32	3.2
Total bifid	60	6.0

Table 3: Comparison of prevalence in males and female of bifid condyles with side involved

Side involved	Prevalence in males (%)	Prevalence in females (%)	P value
Right bifid condyle	4 (0.9)	4 (0.7)	0.838
Left bifid condyle	7 (1.5)	13 (2.4)	0.302
Bilateral bifid condyle	19 (4.1)	13 (2.4)	0.135

In our study prevalence of bifid condyle cases among females was 5.6% and among males 6.5%, which is in correlation with Antoniadis *et al.* (2004)^[12] who found male-female ratio of 1.5:1 and Sahman *et al.* (2011)^[9] reported a ratio between the genders (1.1:1). Our finding were in contrast to Menezes *et al.* (2008)^[8] who found a significantly higher female-male ratio of 3.5:1 and Bhawandeep *et al.* (2017)^[10] whose study showed prevalence of bifid condyle statistically significant with higher prevalence in females as compared to males with a significant *P* value equivalent to 0.001.

In our study, among 60 bifid condyles, 28 were unilateral and 32 were bilateral. Among unilateral cases, 8 (0.8%) showed on the right side and 20 (2%) showed on the left side which is in accordance with Kaur and Padda (2017)^[10] whose study showed that out of the unilateral cases, 1.3% were on the right side and 1.1% were on the left side, again giving a non-significant *P* value. And Haghnegahdar *et al.* (2014)^[11] who also concluded that the prevalence of bifid condyle in the left side was more than the right side.

The etiopathogenesis of bifid condyle remains uncertain, despite of various factors that have been suggested as possible causes.^[4,5] Blackwood^[13] stated that during the early stages of development of the condylar cartilage, it is divided by well-vascularized fibrous septa and suggested that persistence of such a septum, in exaggerated form, within the growing cartilage might result in the error in development that would, in turn, give rise to the bifid condition. The rupture of septal blood vessels is another possible cause of bifid condyle. This theory might explain how forceps delivery, if it caused hematoma, could lead to bifid condyle formation.

Gundlach *et al.*^[14] experimentally induced bifid condyles in animals by injecting teratogenic substances such as N-methyl-N-nitrosourea and formhydroxamic acid in different concentrations at various stages of pregnancy, and they concluded that the bifid condyle is a form of embryopathy which is caused by a combination of a teratogenic agents and the misdirection of the muscle fibers, which then influences bone formation.

The etiology of this entity is still controversial although two major theories have been postulated: traumatic origin and

developmental anomaly. According to the first theory, a new condylar head may form in the space of traumatically broken and displaced condyle in response to the functional demands. On the other hand, remnants of embryonic fibrovascular septa in a developing condyle were considered as the major cause for developmental formation of two partially (or totally) separated heads. Endocrine disorders, deficiency of some nutrients, irradiation, infection, and genetic factors are also mentioned as the possible cause for bifid condyle induction.^[11,15,16]

Although BMC is asymptomatic, some cases show many symptoms, but in most cases, the symptoms are absent. The most common and predominant symptom is TMJ sounds. Pain, restriction of mandibular movements, trismus, swelling, ankylosis, and facial asymmetries can also be present. The treatment of bifid condyles depends on the symptoms showed by the patient. Treatment is not required as bifid condyles do not present any symptoms. Bilateral condylectomy and arthroplasty have been reported to restore the function in cases of ankylosis which is accompanied by bifid condyles.^[17]

Although panoramic radiographic technique is widely used, affordable and easily accessible to patient but disadvantage is it is two dimensional image hence it is difficult to obtain the exact shape of bifid condyle. Therefore, further studies using advanced radiographic techniques such as computed tomography (CT) and cone-beam CT (CBCT) are highly recommended. The limitation of study includes less sample size. Further studies with larger sample size and in the general population need to be performed. The findings from this study can be used to design case control or cohort studies to further understand the relation between bifid condyle and other TMJ disorders. Studies of this nature could potentially help clinicians in identifying high-risk population and help in early diagnosis and help to prevent the occurrence of complications by providing better oral health programs.

Conclusion

Our study suggests that the frequency of bifid condyle is higher in the North Karnataka population than previous studies. It is possible that bifid condyle is a more frequent condition than is commonly perceived. However, because of the minimal or no symptoms associated with condition, we suggest that if panoramic radiograph shows incidental finding of bifid condyle then further confirmatory diagnosis with three-dimensional radiography, such as CBCT, can be followed by follow-up of case.

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