

Condylar Changes on Digital Panoramic Radiograph And Its Association With Age: A Cross-Sectional Study.

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Abstract:

Condyles are vital components of the temporomandibular joint (TMJ), playing a crucial role in jaw movement and function. With aging, the mandibular condyle can undergo various structural changes, which may affect joint function and lead to disorders. Digital panoramic radiography is a non-invasive imaging technique commonly used to visualize these changes, providing detailed insights into the bony structures of the TMJ. Understanding the association between condylar changes and age can help in the early detection and management of TMJ disorders. **Aims and Objectives:** The present study was undertaken to evaluate the prevalence of various types of radiographic changes in the condylar morphology and its association with age on a digital panoramic radiograph. **Materials and Method:** A total of 250 subjects were recruited for the study. They were divided into 3 age groups. 20–40 years (Group A), 41–60 years (Group B) and 61 years and above (Group C). The subjects were evaluated radiographically. **Result:** it was found that, sclerosis (43%) and erosion (19%) was more common in the higher age (age group of 60 years and above). Flattening (69%) was more prevalent in the middle age group (40-60 years). Osteophyte was a rare finding more in the youngest age group (20-40 years). **Conclusion:** The study found that radiographic abnormalities in mandibular condylar morphology increased with age and were more prevalent in patients with temporomandibular dysfunction or tooth loss. These findings suggest a strong correlation between condylar changes and these factors. The high reliability among examiners confirms the consistency of panoramic radiography in assessing these changes.

Keywords: age group, condylar morphology, digital panoramic radiograph.

Introduction:

The temporomandibular joint (TMJ) has many anatomical and functional characteristics that make it unique and complex among the joints of the human body.^[1,2] Condylar remodeling is a physiological process designed to adapt the TMJ structure to various functional demands, driven by the interaction of mechanical forces on the TMJ and the adaptive capacities of the condyle. The components of the TMJ are believed to retain their remodeling ability even after growth has ceased, continuing to alter their structure and morphology over time. Although

these structural changes are thought to be related to TMJ dysfunction, the mechanisms behind these changes—impacted by remodeling, aging, and osteoarthritis—are not yet fully understood.^[3]

Panoramic radiography has been recommended as a screening tool for patients with TMJ-related complaints, as it is effective for detecting gross bony changes in the condyle.^[4] This method is a simple, cost-effective radiographic technique with minimal radiation exposure, suitable for assessing the joint along with the dentition and maxillary-mandibular jaw. The present study aims to evaluate patients from various age groups in an outpatient setting for different oro-dental conditions that warrant diagnostic panoramic radiographs, investigating the correlation between digital panoramic radiographic findings and variations in condylar morphology, as well as their association with patient age. This study has aims and objective as, to study the types of condylar morphology on panoramic radiograph and to co-relate the presence of various types of condylar morphology on panoramic radiograph with the patients of different age groups visiting the outpatient department of the institution.

Materials and methodology:

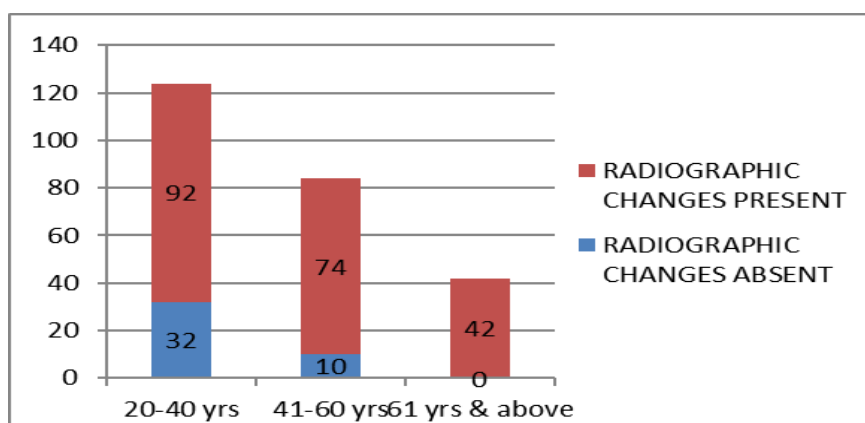
After obtaining institutional ethical clearance this study was conducted. Patients reporting to the Out Patient Department (OPD) of Oral Medicine and Radiology at Awadh Dental College and Hospital during the course of this study. The necessary written informed consent was obtained from all the participant who are willing to be the part of the study. The inclusion criteria were, patients above the age of 20 years comprising of both males and females visiting the dental OPD with indication for panoramic radiograph. The study excluded, patient with developmental anomalies affecting jaws or syndromes of craniofacial structures, patients with history of condylar fractures, surgery of condyles, patients with limited mouth opening due to oral submucous fibrosis, space infections or malignancy of oral cavity, Pregnant and lactating females, panoramic radiographs which do not reveal the condylar morphology. During our study, a total of 208 subjects were included as they were fulfilling the criteria of inclusion. They were divided into 3 age groups. 20–40 years (Group A), 41–60 years (Group B) and 61 years and above (Group C). All subjects were evaluated radiographically.

Results:

The prevalence of radiographic changes in the condylar morphology was found to be statistically significant in all the age groups, relatively lower in Age Group (20-40) (74%). As the age increased, there was a significant increase in the number of subjects with radiographic changes in condylar morphology (P value 0.000). [Table 1 and Graph 1].

Age Group	Changes Absent	Changes Present	Total Patients
20-40 Years	32	92 (74%)	124
41-60 Years	10	74 (88%)	84
> 61 Years	0	42 (100%)	42

Table 1: Age group associated with radiographic changes

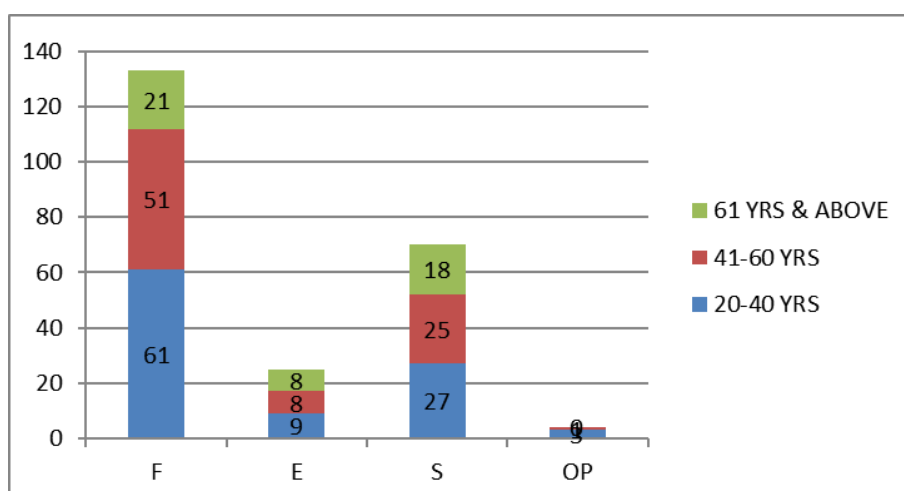


Graph 1: Graphical representation of radiographic changes based on age

The type of radiographic changes associated with age as shown in Table 2 and in Graph 2; it was found that, sclerosis was evident in 43% and erosion in 19% patients. It was more common in the higher age (age group of 60 years and above). Flattening (69%) was more prevalent in the middle age group (40-60 years). Osteophyte was a rare finding more in the youngest age group (20-40 years).

Age Group	Flattening	Erosion	Sclerosis	Osteophyte
20-40 Years	61	9	27	3
41-60 Years	51	8	25	1
> 61 Years	21	8	18	0

Table 2: Correlation of age group with type of condylar changes seen in the OPG



Graph 2: Type of condylar changes associated with various age groups in the sample. (F: Flattening, E: Erosion, S: Sclerosis, OP: Osteophytes)

Discussion:

A total of 208 subjects who were indicated for diagnostic digital panoramic radiographs participated in the study. The relationship between mandibular condylar morphology changes and dentition status has been extensively researched. In this study, subjects were divided into three age groups: Group A [20-40 years], which included 124 patients, found that 92 (74%) had abnormal condylar morphology; Group B [41-60 years], with 84 patients, revealed that 74 (88%) had abnormal condyles; and Group C [61 years and above], consisting of 42 patients, all (100%) exhibited altered condylar morphology. Despite these findings, the differences across age groups were not statistically significant.

These results are consistent with previous research by Pereira et al. [5], Sato et al. [6], Hiltunen et al. [7], Crow et al. [2], and Takayama et al. [4], which did not find a statistically significant association between age and condylar changes. However, they contrast with studies by Muir and Goss [2], Giesen et al. [8], and Harriman et al. [9], which observed a connection between dentition status and condylar changes.

Our study did find that the prevalence of condylar changes was higher in individuals over 40 years (88%) compared to those under 40 years (74%), with this difference being statistically significant (P value 0.000). Additionally, as age increased, the number of affected condyles also rose, with Groups B and C showing more condylar changes than Group A, which was statistically significant (P value 0.000).

This aligns with findings from Muir and Goss [2], Huuonen et al, [10], and Takayama et al. [4], who noted that significant condylar changes were more prevalent in older age groups, though they observed that this does not follow a direct linear relationship. The progressive nature of adaptive or degenerative changes in the temporomandibular joint over time supports the idea that condylar changes increase with age. Nonetheless, these results diverge from studies suggesting that condylar changes are more common in younger age groups or are present across all age ranges.^[11] For example, Crow et al,^[2] reported morphologic condylar changes in

panoramic radiographs across all adult age ranges, attributing the high prevalence of minor condylar changes to natural remodelling processes.

In our study, the most frequent radiographic finding was condylar flattening, observed in 133 subjects (60%), followed by sclerosis in 70 subjects (34%), erosion in 25 subjects (12%), and osteophyte formation in 4 subjects (1.9%). Flattening, erosion, and sclerosis were observed with similar frequencies across age groups, while osteophytes were less prevalent in older individuals. This is somewhat inconsistent with the findings of Sato et al [6] Hiltunen et al [7] and Takayama et al. [4] where flattening was the most common finding, followed by erosion, osteophytes, and sclerosis.

Conclusion:

Radiographic abnormalities in condylar morphology were observed to increase with age. The most common morphological change identified was flattening of the condyle, followed by sclerosis, erosion, and osteophyte formation. These abnormalities were more prevalent in older patients and those with tooth loss, with the differences being statistically significant. Limitations of the study included the small sample size and reliance solely on digital panoramic radiography for assessing condylar changes. Future research should involve larger sample sizes and incorporate advanced 3-dimensional radiographic modalities or functional imaging techniques to provide a more comprehensive evaluation of condylar morphology.

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