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# Correlation Between Unilateral Free End Edentulous and Morphological Variations of Condyle Using Panoramic Radiographs in Dental Hospital of South Sumatera Province

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**Abstract**

**Background:** Unilateral free end edentulous can cause a habit of one side chewing which will affect the condition of the temporomandibular joint (TMJ) mechanism. The TMJ is a complex joint consisting of the glenoid fossa, mandibular condyle and disc articular. No previous studies have examined the correlation between free end edentulous and morphological variations in the mandibular condyles. **Purpose:** to determine the correlation between unilateral free end edentulous and morphological variations of condyle using panoramic radiographs in Dental Hospital of South Sumatra Province. **Methods:** This analytic observational study was using 68 samples of panoramic radiographs at RSKGM South Sumatra in September 2019 - March 2020. The sample was divided into 34 unilateral free end edentulous and 34 complete teeth. The condyle morphology of each sample was traced, and the data obtained were analyzed using the Chi-square method in the SPSS application. **Results:** Morphological abnormalities of the condyles were more frequently seen in patients with unilateral free end edentulous conditions, that is 41.18%. While in patients with complete teeth, the visible abnormalities of the condyles was only 5.88%. There was a significant correlation between unilateral free end edentulous and morphological variations of mandibular condyles ($p<0.005$). **Conclusion:** There is a correlation between unilateral free end edentulous and morphological variations of condyle using panoramic radiographs in Dental Hospital of South Sumatra Province.
**Keywords:** Condyle; Edentulous; Panoramic radiographs; Unilateral free end

## Introduction

Edentulous is a condition where there is a loss of one or more teeth, which can cause various new problems.[1] One type of edentulous is the unilateral free end that can cause habitual chewing on one side. It will affect the condition of the temporomandibular joint (TMJ), one of which is TMJ Disorder.[2,3] TMJ disorder (TMD) is a degenerative musculoskeletal condition associated with morphological and functional deformities. The characteristic changes observed in the TMJ include changes in the overall shape and size of the joint components include the mandibular condyle.[4]

Many studies on the morphology of the mandibular condyles have been conducted using various methods such as dry skull studies, histology, autopsy, and radiographs. Hiltunen et al. stated that in edentulous conditions, the most common shape of the mandibular condyle was flattening.[5] Gharge et al. stated differences in the condyle shape between non-edentulous and edentulous individuals.[6] These morphological changes can occur due to simple developmental variability or remodeling of the mandibular condyle to accommodate developmental changes, malocclusion, trauma, and other developmental abnormalities and degenerative pathologies.[7]

In dentistry, radiography plays a significant role in making a diagnosis. Panoramic is one type of radiograph that reliable to provide a comprehensive picture of the jaw, including the mandibular condyle in the mandible. Hence, panoramic radiographs can be used to diagnose abnormalities or structures in the jaw or mandibular condyle.[8,9]

The aim of this study was to determine the correlation between unilateral free end edentulous and morphological variations of condyle using panoramic radiographs at South Sumatera RSKGM.

**Methods**

This study used the panoramic radiographs secondary data at the RSKGM Sumsel in the period September 2019 - March 2020. The panoramic radiograph was collected directly by the researcher at the Department of Dental Radiology at RSKGM Sumsel. A total sample of 68 panoramic photos consisted of 34 unilateral free-end cases, of which 16 free-end cases were on the right side and 18 free-end cases on the left side. Another 34 radiographs were cases of complete teeth. Mandibular condyle on the left and right sides was traced manually in each panoramic radiograph. After the observation, the data obtained will be examined by intra-observer, and inter-observer by a dental radiologist.

The morphological variations of the condyles in this study were divided into 8 groups: Normal (rounded, angled, convex), Osteophyte, Erosion, Flattening, Degenerative Joint Disorder (DJD), Sclerosis, Ossicle, and Microcyst. The morphological variations of the condyle can be seen

in Figure 1. The data was collected and analyzed statistically using Chi-Square method in the SPSS application.

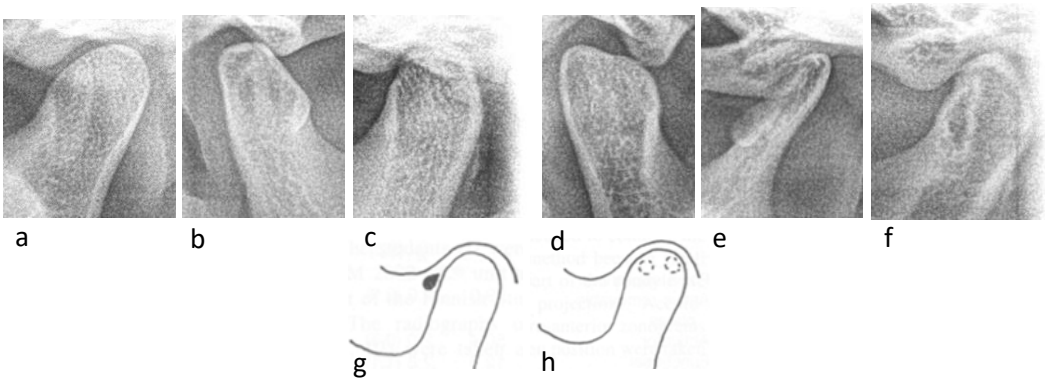


**Figure 1**: A. Normal; B. Osteophyte; C. Erosion; D. Flattening; E. DJD; F. Sclerosis; G. Ossicle; H. Microcyst.

## Results

The distribution of the morphological variation of the condyle in 16 patients with unilateral free end edentulous on the right side can be seen in Table 1. In this condition, the most common normal variation of the condyle morphology was rounded shape, followed by angled shape. The most visible deformity was flattening condyles followed by osteophytes and sclerosis.

**Table 1.** Table of frequency distribution of condyle morphology variations on the right free end

| NO | Variable | | Frequency | | | |
|---|---|---|---|---|---|---|
| | | | **Condyle side** | **Condyle shape** | **Total** | **N %** |
| 1. | Free end | Right | Right | Rounded | 8 | 25 % |
| | | | | Angled | 3 | 9,37 % |
| | | | | Convex | 0 | 0 % |
| | | | | Osteophyte | 1 | 3,12 % |
| | | | | Microcyst | 0 | 0 % |
| | | | | Sclerosis | 0 | 0 % |
| | | | | Erosion | 0 | 0 % |
| | | | | Osiccle | 0 | 0 % |
| | | | | Flattening | 4 | 12,5 % |
| | | | | DJD | 0 | 0 % |
| | | | Left | Rounded | 7 | 21,87 % |
| | | | | Angled | 3 | 9,37 % |
| | | | | Convex | 0 | 0 % |
| | | | | Osteophyte | 2 | 6,25 % |
| | | | | Microcyst | 0 | 0 % |
| | | | | Sclerosis | 1 | 3,12 % |
| | | | | Erosion | 0 | 0 % |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Osiccle | 0 | 0 % |
| | | | | Flattening | 3 | 9,37% |
| | | | | DJD | 0 | 0 % |

The distribution of the morphological variation of the condyle in 18 patients with unilateral free end edentulous on the left side can be seen in Table 2. This table shows similar results to Table 1, where the most common normal variation of the condyle morphology was rounded shape, and the most visible deformity was flattening condyles followed by osteophytes and sclerosis.

**Table 2.** Table of the frequency distribution of the morphology of the condyle at the left free end

| NO | Variable | | Frequency | | | |
|---|---|---|---|---|---|---|
| | | | Condyle side | Condyle shape | Total | N % |
| 1. | Free end | Left | Right | Rounded | 10 | 27,77 % |
| | | | | Angled | 1 | 2,63 % |
| | | | | Convex | 0 | 0 % |
| | | | | Osteophyte | 3 | 7,89 % |
| | | | | Microcyst | 0 | 0 % |
| | | | | Sclerosis | 1 | 2,63 % |
| | | | | Erosion | 0 | 0 % |
| | | | | Osiccle | 0 | 0 % |
| | | | | Flattening | 3 | 7,89 % |
| | | | | DJD | 0 | 0 % |
| | | | Left | Rounded | 7 | 18,42 % |
| | | | | Angled | 1 | 2,63 % |
| | | | | Convex | 0 | 0 % |
| | | | | Osteophyte | 2 | 5,26 % |
| | | | | Microcyst | 0 | 0 % |
| | | | | Sclerosis | 0 | 0 % |
| | | | | Erosion | 1 | 2,63% |
| | | | | Osiccle | 0 | 0 % |
| | | | | Flattening | 5 | 13,15 % |
| | | | | DJD | 2 | 5,26 % |

The distribution of the morphological variations of the condyles in 34 radiographs of patients with complete teeth can be seen in Table 3. In this condition, the most frequently normal shape variation is rounded followed by angled shape. For visible deformity, there were only 4 cases with flattening shape. There were no other variations found.

**Table 3.** Table of frequency distribution of condyle morphology variation at non-free end

| NO | Variable | Frequency | | | |
|---|---|---|---|---|---|
| | | **Condyle side** | **Condyle shape** | **Total** | **N %** |
| 1. | Complete teeth | Right | Rounded | 30 | 44,11 % |
| | | | Angled | 1 | 1, 47 % |
| | | | Convex | 0 | 0 % |
| | | | Osteophyte | 0 | 0 % |
| | | | Microcyst | 0 | 0 % |
| | | | Sclerosis | 0 | 0 % |
| | | | Erosion | 0 | 0 % |
| | | | Osiccle | 0 | 0 % |
| | | | Flattening | 3 | 4,41 % |
| | | | DJD | 0 | 0 % |
| | | Left | Rounded | 32 | 47,05 % |
| | | | Angled | 1 | 1,47 % |
| | | | Convex | 0 | 0 % |
| | | | Osteophyte | 0 | 0 % |
| | | | Microcyst | 0 | 0 % |
| | | | Sclerosis | 0 | 0 % |
| | | | Erosion | 0 | 0 % |
| | | | Osiccle | 0 | 0 % |
| | | | Flattening | 1 | 1,47 % |
| | | | DJD | 0 | 0 % |

**Table 4.** Table of relationship between unilateral edentulous free end and morphological variations of mandibular condyles using chi square

| | | **Morphological variations of the condyle** | | | **Total** | **P- value** |
|---|---|---|---|---|---|---|
| | | Both condyles normal | One of the condyles is abnormal | Both condyles are abnormal | | |
| **Free end** | Right free end | 10 | 1 | 5 | 16 | 0,002 |
| | Left free end | 8 | 3 | 7 | 18 | |
| | Complete teeth | 30 | 4 | 0 | 34 | |
| **Total** | | 48 | 8 | 12 | 68 | |

Based on the results above, it can be seen that patients with unilateral free-end edentulous conditions more often display abnormalities in the morphology of the condyle than patients with complete dentition, which is 41.18% of all condyles in unilateral free-end edentulous cases. In this study, the most common morphological abnormality in unilateral free-end edentulous conditions is flattening followed by osteophytes. The distribution can be seen in Table 3 and 4. Meanwhile, in

patients with complete teeth, only 5.88% of condyle deformities were seen. After analyzing the data using the Chi-square, it was found that there was a correlation between unilateral free end edentulous and morphological variations of condyle (P value <0.005) (Table 4).

**Discussion**

The results of this study indicate that the loss of teeth can change the morphology of the condyles. Based on the results of the study, the most common morphological variation of the condyle is flattening followed by osteophytes in both conditions, free end edentulous and complete dentition. The normal shape of the condyle is convex, but if there is a degenerative disorder, the condyle will flatten. Gharge et al. analyzed the changes of TMJ in edentulous and dentulous patients using panoramic imaging. They found that flattening was the most common bony change noted in dentulous and partially edentulous patients, followed by osteophyte. Meanwhile, the most common feature noted in completely edentulous patients was resorption.[5] Flattening, erosion, osteophyte are regarded as degenerative changes and may be resulted from trauma or overload of TMJ.[6,7] Loss of teeth in one or both jaws causes a change in intercuspal position and ultimately causes a pathological change in the position of the condyles in the glenoid fossa.[8]

Abnormal variations in the morphology of the condyles are more common in edentulous conditions than in patients with complete teeth. While in dentulous patients, normal condylar morphological variation is more common. For morphological variations of normal condyles, the most commonly found is rounded shape. A normal variation of the condylar morphology occurs with age, gender, facial type, occlusal force, functional load, malocclusion type, and between right and left sides.[7] Chewing and distribution of occlusal load in an individual with complete dentition is relatively more balanced on both sides, hence the working mechanism of the TMJ will be normal, which will reduce the risk of degenerative disorders.

The P-value of the results of this study was 0.002, so it means that there is a correlation between unilateral free end edentulous and morphological variations of the condyle. There are no previous studies that examine the relationship between unilateral free-end edentulous with variations in the morphology of the condyle. These results are in line with a similar study conducted

by Uma et al., which examined the different positions of the mandibular condyle and articular fossa in edentulous and non-edentulous patients. The study showed that there was a significant difference in the angulation position of the mandibular condyle between patients with edentulous and without edentulous conditions, which means that there is a relationship between loss of teeth and condyle morphology.[8]

The results of this study did not find variations in the morphology of the condyle with the shape of convex, microcyst, osiccle. This may be due to the edentulous condition experienced by the sample in this study, it may not have occurred for too long, or it may not have been too severe. Variations in the morphology of these condyles can be influenced by several other factors, likes developmental defects, syndromes, inflammation, cysts and tumors in the TMJ, metabolic diseases, endocrine disorders, trauma, and radiation. Apart from these factors, this variation is also influenced by the severity and duration of the condition.[10,11]

The weakness in this study is that the data used are secondary data that does not include other conditions of the patient so that they cannot pay attention to other conditions that can affect changes in the morphology of the condyle such as the patient's bad habits, length of time to lose teeth, and conditions or diseases suffered by the patients that will have an impact on the results of this study.

## Conclusion

It can be concluded from the results of this study that there is a correlation between unilateral free end edentulous and morphological variations of condyle. With abnormalities of the morphology of the condyle, the most commonly seen is flattening.

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