

## Evaluation of Pound concept in determination of mediolateral mandibular posterior teeth position

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### Abstract

**Background:** The ideal teeth arrangement is an important step for success in complete denture fabrication. There are different methods for determining the posterior denture teeth location. The purpose of this study was the comparison of posterior mandibular teeth location in the study group with Pound or Misch theory. **Material and methods:** An alginate mandibular impression of 80 dentate patients was taken and poured with dental stone. Retromolar pad area, mesial of canine and the lingual cusps of each posterior tooth marked on the cast and then transferred to the graded paper. Distance of each lingual cusp from the internal line of Pound triangle was measured. Data were analyzed with SPSS version 16.0. **Result:** In the study group, the average distance of lingual mandibular cusp from the internal line of Pound triangle was 1.69 mm in first premolars, 0.94 mm in second premolars, 0.7 mm in first molars and 0.75 mm in second molars. **Conclusion:** In most cases, distance of lingual mandibular cusps was within 1 mm of Pound triangle. Results were more similar to the Pound rather than the Misch theory.

**Keywords:** Pound triangle, Misch triangle, posterior teeth.

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## Introduction

Ideal teeth arrangement in complete denture therapy has been concerned since ancient times when attempts were made to replace lost teeth (1).

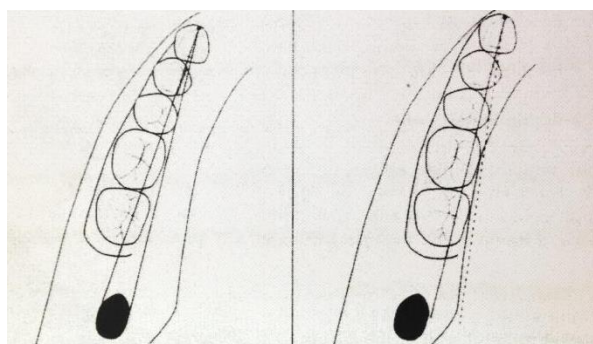
The optimal location of artificial teeth should be considered for ideal complete denture retention, stability and support (2).

Residual ridge resorption is a time dependent and irreversible bone loss process. In the lower jaw, a larger proportion of bone loss tends to occur on the lingual side. The end result is an arch form that is frequently not on the residual ridge (3). The occlusal centric contacts follow the guideline of lingualized occlusion described by Payne and Pound and Murrell (4, 5). In lingualized articulation only the lingual cusps of the maxillary posterior teeth are in contact during centric occlusion. It could be concluded that the primary contact is the lingual cusp of the maxillary teeth rather than the buccal cusp of the mandibular teeth. This is acting as an additional stabilizing factor for the maxillary denture, directing forces closer to the residual ridge (6, 7).

Pound showed that the buccolingual position of maxillary teeth controlled by the position of posterior mandibular teeth. He recommended that the lingual surfaces of mandibular posterior denture teeth should occupy an area bounded by two lines originating from the mesial surface of the mandibular canine and extending posteriorly to the lingual and buccal aspect of the retromolarpad. This area has been called Pound triangle (5, 8, 9).

Misch proposed drawing a line from distal aspect of the canine to the medial aspect of the retromolarpad. The central fossa of the mandibular posterior teeth then is positioned just buccal to this line, and lingual surfaces are lingual of this line (Fig. 1) (6).

The aim of this study was the comparison of posterior mandibular teeth position in the study group to the positions recommended by Pound or Misch theory.



**Figure 1.** A: Pound triangle, B: Misch triangle

## Method and Material

This study was done on 80 patients with natural teeth. An alginate (Alginoplast, Heraeus Kulzer, Hanau, Germany) mandibular impression was taken for each patient and poured with dental stone (milad dent, Garmsar, Iran). The retromolar pad area, mesial of canine and the lingual cusps of each posterior tooth were marked on the cast with a graphic pencil. (Fig. 2) These marks were transferred to the transplant plate that rested on the cast. Then, all marks were transferred to the graded paper from the transplant plate and The Pound triangle was drawn for left and right side of the mandible. Distance of each lingual cusp from the internal line of Pound triangle was measured with an mm scaled ruler.

Points which were medial to the internal line of Pound triangle presented with (-) mark and points were placed in the Pound triangle were presented with (+) mark.

All measurements were done with the same practitioner with a simple ruler (0.01 mm accuracy).

Data were analyzed with SPSS version 16.0 (Microsoft Inc., IL, USA). Absolute and relative frequencies were presented for each posterior tooth separately.



**Figure 2.** The lingual cusps and retromolar pad was marked on the casts

## Results

80 patients (160 quadrant) were assessed in this study and results reported for each premolar and molar teeth.

22 cases of 160 first premolar (13.8%), 34 cases of 160 second premolar (21.3%), 12 cases of 160 first molar (7.5%) and 36 cases of 160 second molar (22.5%) were located on the pound triangle. Absolute and Relative frequency for each distance from the internal line of Pound triangle was reported in table 1.

132 cases of first premolar (82.5%), 108 cases of second premolar (67.4%), 109 cases of first molar (68.1%) and 100 cases of second molar (62.4%) were located buccal to the midretromolarpad- canine line. In

General, most of the posterior teeth were located buccal to the Pound triangle.

A small number of teeth ( 3.7% of first premolar,11.3% of second premolar, 24.4% of first molar and 15.1% of second molar) located more medially than the Pound triangle that is indicated with (-) mark in the table. According to the Misch triangle (that is located medial to the Pound triangle), less number of posterior teeth were in the Misch triangle.

The highest percent of first premolar (20.6%) and first molar (27.5%) were in the 1mm distance buccal to the midretromolarpad- canine line. But the highest percent of second molar (22.5%) were on the midretromolarpad- canine line.

**Table 1.** Absolute and relative frequency of posterior mandibular teeth according to distance from Pound triangle.

Distance	Relative frequency for each tooth			
	First premolar	Second premolar	First molar	Second molar
-3	0(0%)	0(0%)	0(0%)	2(1.3%)
-2.5	0(0%)	0(0%)	1(0.6%)	0(0%)
-2	0(0%)	2(1.3%)	3(1.9%)	0(0%)
-1.5	1(0.6%)	1(0.6%)	8(5%)	2(1.3%)
-1	5(3.1%)	12(7.5%)	14(8.8%)	7(4.4%)
-0.5	0(0%)	3(1.9%)	13(8.1%)	13(8.1%)
0	22(13.8%)	34(21.3%)	12(7.5%)	36(22.5%)
0.5	9(5.6%)	16(10%)	23(14.4%)	21(13.1%)
1	33(20.6%)	32(20%)	44(27.5%)	33(20.6%)
1.5	11(6.9%)	14(8.7%)	11(6.9%)	15(9.4%)
2	25(15.6%)	26(16.3%)	12(7.5%)	16(10%)
2.5	13(8.1%)	9(5.6%)	6(3.8%)	5(3.1%)
3	19(11.9%)	9(5.6%)	9(5.6%)	5(3.1%)
3.5	9(5.6%)	2(1.3%)	2(1.3%)	5(3.1%)
4	13(8.1%)	0(0%)	2(1.3%)	0(0%)

## Discussion

The purpose of lingualized occlusal concept is improvement in prosthesis stability and force reduction on the mucous membrane and alveolar bone. In lingualized occlusion, occlusal contacts are focused between the maxillary palatal cusps and the mandibular central fossa. The buccal cusps of both the maxillary and mandibular teeth appear normal but they do not touch in occlusion or excursions. This moves the contacts toward the midline. For lingualized articulation, this location identified as “neutral zone” (3).

In This study, the position of the lingual cusps of the mandibular teeth in 80 patients with proper jaw relationship and occlusion was compared with the lingual cusps position referred to by Pound and Misch. Results reported for each first and second premolars and molars. Pound evaluated the mandibular lingual cusp position in 30 patients. He concluded that in most patients, lingual cusps are located more buccally than the lingual border of Pound triangle. In the majority of patients, the lingual cusps extended 2mm beyond the

line, whereas in about 10% they extended to 3mm, and another one third were in 1mm beyond the line.(5,6)

In the similar study, Misch concluded that in all patients the lingual contour of the teeth extended 1-3 mm lingual of Pound most medial (5, 9).

In the present study, the relative and absolute frequency of distances from Pound triangle was determined. Results showed that most of lingual cusps were located 1mm buccally and 33% of total cases were in 0.5-1mm buccally than the medial line of Pound triangle. On the other hand, the position of lingual cusps in this study was in a less distance to the medial line of Pound triangle than the Pound’s research.

The relative frequency of lingual cusps position that located at 2mm distance from the lingual border of Pound triangle was 12.3% in this study.

The tooth position originally suggested by Pound positions the mandibular central fossa of all teeth on the canine- mid retromolar pad line. This position is similar to natural teeth position and helps stabilize the mandibular denture. Misch has suggested that for mandibular implant prosthesis, denture teeth may be

set medial to the retromolar pad in a position similar to natural teeth. The more medial the posterior denture teeth, the more vertical the occlusal forces generated over the maxillary bone; thus, reducing tipping and enhancing the upper denture stability during function. (6, 10)

16.3% of all patients showed that lingual cusp of all posterior teeth located on the Pound triangle. It is suggested that this position transmitted the occlusal forces more vertically to the maxillary arch and also increase the mandibular denture functional stability.

In this study, the most frequent position of lingual cusps was in 1mm distance to the Pound triangle but the most frequent position in the both Pound and Misch study was 2mm from each triangles.

In the Misch study in comparison to our study, fewer teeth were in the range of 1mm distance from the Pound triangle and more teeth were in the 3mm distance.

Although there is some difference between the results of this study and the results of Pound research, our results were more similar to the Pound's study than to that of Misch.

### Conclusion

The most frequent position of lingual cusps in this study was in 1mm distance buccal to the Pound triangle. Although there is some difference between the results of this study and the results of Pound research, Pound theory is applicable in posterior teeth arrangement for Iranian population.

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