

vertical position of mental foramen mostly could be found in position 3 (59.3%), next were position 2 (37%), and last were position 1 (3.7%).

In the 36-45 year old category, vertical position of mental foramen mostly could be found in position 3 (55%), next were position 2 (35%), and lastly position 1 (10%). In the age category of 46-55 years old, the foramens were located vertically. The most common mental encountered were a numbered position 78.6%, next were position 2 (14.3%), and last were positioned with 7.1%.

In the age category of 56-65 years old, vertical position of mental foramen mostly could be found in position 3 (60%), next were position 2 (40%). While for the age of 65 years old, vertical position of mental foramen mostly could be found in position 1 (100%).

Table 1. Variations of vertical position of mental foramen on human based on age category.

Age (in Years)	Foramen Position						Total	
	1		2		3		N	%
	N	%	N	%	N	%		
12-16	0	0.0	4	57.1	3	42.9	7	100.0
17-25	5	20.8	6	25.0	13	54.2	24	100.0
26-35	1	3.7	10	37.0	16	59.3	27	100.0
36-45	2	10.0	7	35.0	11	55.0	20	100.0
46-55	1	7.1	2	14.3	11	78.6	14	100.0
56-65	2	40.0	0	0.0	3	60.0	5	100.0
> 65	1	100.0	0	0.0	0	0.0	1	100.0
Total	12	12.2	29	29.6	57	58.2	98	100.0

From 98 samples of radiography images, vertical position of mental foramens were mostly located in position 3 (58.2%), followed by position 2 (29.6%) (Table 2).

Table 2. Distribution of of mental foramen position.

Foramen Position	N	%
1	12	12.2
2	29	29.6
3	57	58.2

It was found that in the period of the permanent tooth eruption in the category of 12-16 years old of age, mental foramens were mostly found in position 2 which located in the middle of mandible corpus, equal between the upper and lower border with total number of 57.1%. This case was in line with the theory, which stated that before the permanent tooth erupted, vertical position of mental foramen located near close with the alveolar ridge and slowly will moving further from alveolar ridge as the time for the eruption of permanent tooth begins.

While in the age category of 17-25 years old, 26-35 years old, 36-45 years old, and 46-55 years old, it was found that vertical position of mental foramen mostly located in position 3 which located near to the lower border of mandible corpus (Figures 1 and 2) This was in line with the theory which states that in the eruption period of permanent tooth, mental foramen vertical position is getting further from alveolar ridge and getting closer with the lower border of mandible corpus.

In the fourth age category, it was also found some samples where mental foramen located in position 1 which was located near the alveolar ridge. It was matched with the theory which stated that when individual is in their old age, the mental foramen was slowly getting closer with alveolar ridge due to the alveolar bone resorption process.



Figure 1. Third Position of mental foramen (patient 24 years old).



Figure 2. Mental foramen position (patient 36 years old).

Lastly, at age of 46-55 years old, and age >65 years old, there were many samples where the mental foramen vertically located in the position. One position where mental foramen was located near alveolar ridge. It was in line with a theory, which stated that in the old age, the resorption process of alveolar bone occurred rapidly, which caused the mental foramen appeared back close to the alveolar ridge. Moreover, mental foramen was often cannot be identified because of this severe resorption process.

Discussion

An accurate identification process of the mental foramen was essential both for diagnostic and surgical processes [8]. The mental foramen was part of the mentalis canal, which is consist of mental nerve, sensory innervation of the lower lips, bilateral vestibulum and mesial gingiva of the mandible molar [9]. The position of the mental foramen both horizontally and vertically was reported influenced by many factors. Failure that occurred during the injection and surgery process was usually caused by differences of mental foramen positions in some community groups [8].



Based on previous research it was showed that the most common mental foramen position was found in position B, located at a distance of 1.0 cm -1.5 cm from the lower border of the mandible [10]. The mean of distance from the mental foramen to the inferior border of the mandible in Caucasian population was in the range of 14-15 mm and 10.33-13.67 mm. This is in contrast to the results obtained in the Iranian population who found that the mental foramen was closer to the alveolar crest than the Caucasian population [11].

Many variations of mental foramen's position were influenced by ethnicity, race, sex and age. Furthermore, it was known that mental foramen's position was indeed always moving as each individual grows older whether in term of horizontal or vertical position [9].

In the childhood age, before the deciduous teeth erupted until the position becomes permanent halfway to mandible and closer to the lower border of mandible after all teeth erupted. For the individuals in their old age, resorption occurred in mandible bone would bring mental foramen closer to alveolar ridge. When all teeth have already fallen off (edentulous), mental foramen would appear quite close to alveolar ridge, even in the quite severe resorption state, which caused mental foramen gone and replaced with concave which located in every surface of mandible [12-15].

In geriatric, the position of the foramen mentale moved to the superior border of the mandible. The main cause was tooth loss and resorption of bone. There was a significant difference from the variation of foramen mentale position by age [16]. In menopausal women, estrogen hormone deficiency accelerated skeletal bone loss and alveolar bone resorption. This can be seen from bone mineral density based on orthopantomography examination [17].

Based on that theory, it was similar with the result from this study where the vertical position of mental foramen will always be moving as each individual grows older, and it makes age prediction is possible to be done with the vertical position of mental foramen examination by using panoramic radiography image result. Panoramic radiography was used in this study because the foramen mental would appear consistently than periapical radiography [18-20]. A common limitation of periapical radiography results in detecting the location of the mental foramen was the mental foramen position that appears at the edges of the film made it difficult to accurately measure the position of the mental foramen [21-23].

Conclusion

Mental foramen was the anatomic structure, which located in mandible; this channel becomes the outlet of nervous mental and blood vessel. Mental foramen had many varieties of size, shape and location. This study focused on discussion about the vertical position of mental foramen. Vertically, mental foramen's position was divided into three positions namely lead closer to alveolar ridge, located in the middle of mandible corpus and located closer in lower border of mandible corpus.

Individual's age affected the mental foramen's position. In the eruption period of permanent tooth, mental foramen located closer with alveolar ridge. After passing the eruption period, mental foramen would move to the halfway of mandible corpus lower border. As each individual's grow

older and teeth had fallen off, mental foramen would appear again getting closer with alveolar ridge, it was related with the process of alveolar bone resorption that already occurred.

The process of identifying mental foramen to predict individual's age in the relation with forensic odontology was possible to be done by using roentgen image in mandible of the dead victim. Although it still required further identification, mental foramen's position could be one of the references in predicting individual's age.

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