

INTRODUCTION

1. The anterior loop of the inferior alveolar nerve is regarded as an inconsistent anatomical landmark in the premolar region which may affect the site of the implant osteotomy¹.
2. The inferior alveolar and the mental nerve can be subjected to iatrogenic injury during various surgical procedures such as genioplasty and implant osteotomy².
3. The current concept of "All-on-4" in placing implants in the mandible suggests two angled posterior implants to avoid the anterior loop³.
4. Therefore, more information about the location and length of the anterior loop of the inferior alveolar nerve is required so that the number and the location of the implant osteotomy sites can easily be planned

OBJECTIVES

1. To measure the prevalence of anterior loop presence.
2. To measure the average length of the loop on the right and left sides.
3. To evaluate sex- and ethnicity-related variations in the length of the anterior loop in the study population.

INCLUSION/EXCLUSION CRITERIA

Inclusion criteria

- ✓ Dentate or edentulous patients of three ethnicities (Malay, Chinese and Indian) between the ages of 18 and 80 years.
- ✓ Healthy, medically compromised or even those previously radiated patients but not involving the interforaminal region of the mandible.

Exclusion criteria

- ✓ Patients with a history of trauma or pathology to the mandible.
- ✓ Syndromic patients and patients with congenital disorders.
- ✓ Patients with a history of surgical intervention to the interforaminal region like orthognathic surgery or chin bone harvesting procedures.
- ✓ Patients of mixed racial origins.
- ✓ Reformatted CBCT images that appear distorted or blurred due to patients' movements.

STATISTICAL ANALYSIS

- All data were processed with software (SPSS statistics v24.0; IBM Corp).
- The **t-test** was used to compare differences in the mean values of nerve lengths between the sexes and between the left and right sides.
- **One-way ANOVA** was used to compare differences in mean length between ethnicity.
- Statistical significance was determined at the **p<0.05** level.

MATERIALS AND METHODS

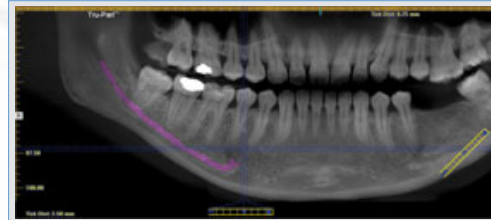


Figure 1. Inferior alveolar nerve traced along with the anterior loop and incisive foramen using ExamVision software.

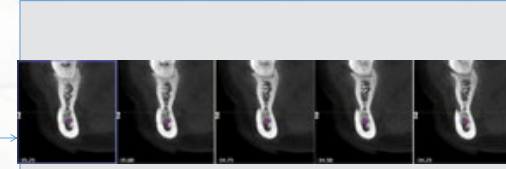


Figure 2. Mental foramen is located and marked on the cross sectional view.

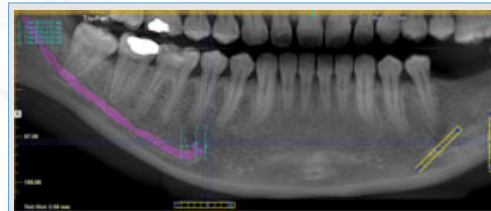


Figure 3. Distal and mesial boundary of mental foramen and anterior loop was marked and measured.



Figure 4. Vertical height of nerve was estimated from the canal to the opening of mental foramen.

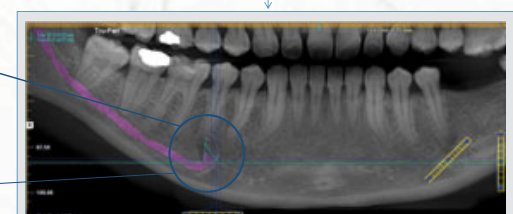
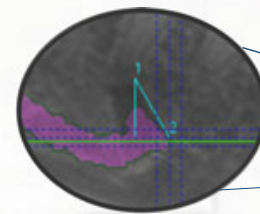


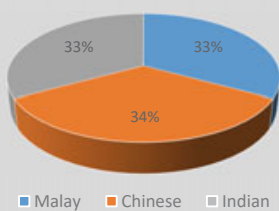
Figure 5. Oblique measurement line was drawn from Point 1 and Point 2 and recorded as actual length.

RESULTS

- 100 CBCT DICOM image files were studied. An equal number of male and female subjects were obtained.
- The anterior loop was present in 94% of the subjects.
- The length of the anterior loop ranged between 0.73mm and 7.99mm.

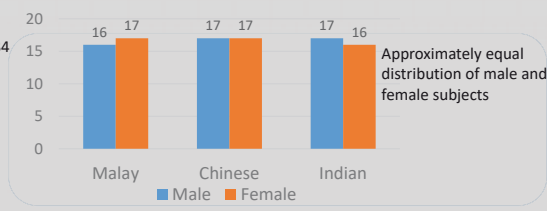
Subject Characteristics

Demographics

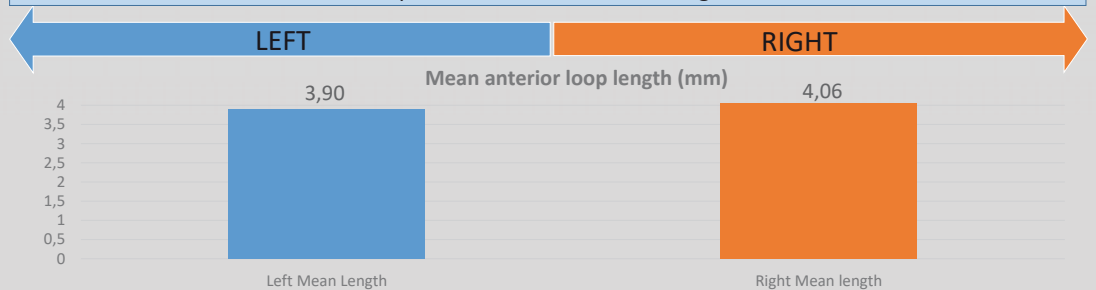


33 Malay, 33 Indian and 34 Chinese subjects were included in the study

Gender distribution



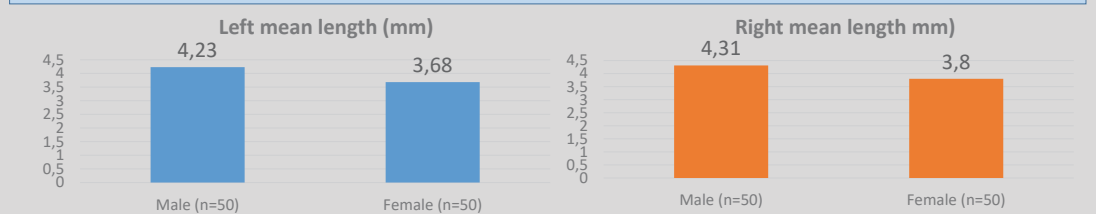
Comparison between Left and Right



Comparison between Ethnic Groups

Tukey HSD							
Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Left mean length	Malay	Indian	0.73354	0.36174	0.112	-0.1289	1.5959
	Indian	Chinese	-0.44676	0.36174	0.436	-1.3092	0.4156
	Chinese	Malay	-0.28677	0.35566	0.700	-1.1347	0.5611
Right mean length	Malay	Indian	0.51298	0.38680	0.384	-0.4085	1.4344
	Indian	Chinese	0.10961	0.38395	0.956	-0.8051	1.0243
	Chinese	Malay	-0.62259	0.37762	0.231	-1.5222	0.2770

Comparison of Left and Right Between Gender

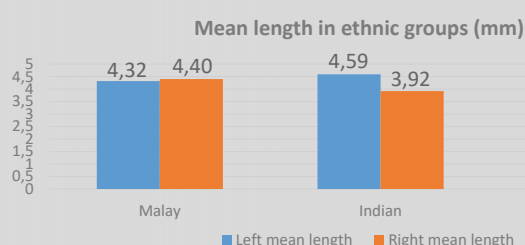


Comparison Between Gender within Ethnic Groups

	Male			Female			P value
	n	Mean	Standard Deviation	n	Mean	Standard Deviation	
Left Mean Length (mm)							
Malay	15	4.78	1.57	16	3.88	1.45	0.110
Chinese	17	3.83	1.52	15	3.99	1.07	0.724
Indian	15	4.02	1.51	14	3.11	1.37	0.099
Right Mean Length (mm)							
Malay	15	4.65	1.46	17	4.25	1.52	0.457
Chinese	17	3.75	1.32	16	3.88	1.53	0.789
Indian	16	4.58	1.44	14	3.17	1.66	0.019*

*p<0.05 value shows statistically significant differences

Comparison between Left and Right within Ethnic Groups



DISCUSSION

1. The mean length of the anterior loop is found to be higher than reported in previous studies. This may be due to the difference in measurement techniques.
 - ✓ Uchida et.al measured the loop from **dry mandibles** which allows more accurate measurement.
 - ✓ Juan et.al isolated the nerve by **eliminating other soft and hard tissue images**, therefore providing a more accurate measurement.
2. Limitations:
 - ✓ Measuring tool of the software were **not sufficiently sensitive**.
 - ✓ **2D slices from cross sectional view** was used to estimate the mesial boundary of the anterior loop and mental foramen.

CONCLUSION

- ✓ The mean length of the anterior loop in this study was **3.90±1.41mm** on the left and **4.06±1.53mm** on the right with no significant difference between sides or ethnic groups.
- ✓ However, there were significant differences between the anterior loop of males and females on the left side (p=.041) and males and females in Indians (p=0.019).
- ✓ Care should be taken when placing implants in the region around the mental foramen.
- ✓ A CBCT scan for a patient is **necessary** for an accurate determination and visualisation of the length of the anterior loop due to its variability.

REFERENCES

1. G. Greenstein, D. Tarnow. The mental foramen and nerve: clinical and anatomical factors related to dental implant placement: a literature review. J. Periodontol., 77 (12) (2006), pp. 1933-1943
2. Hwang K, Lee WJ, Song YB, Chung IH. Vulnerability of the inferior alveolar nerve and mental nerve during genioplasty: an anatomic study. J Craniofac Surg 2005;16:10-4.
3. Michael H. Chan, Curtis Holmes. Contemporary "All-on-4" Concept. Dental Clinics of North America 2015; 59(2): 421-470.