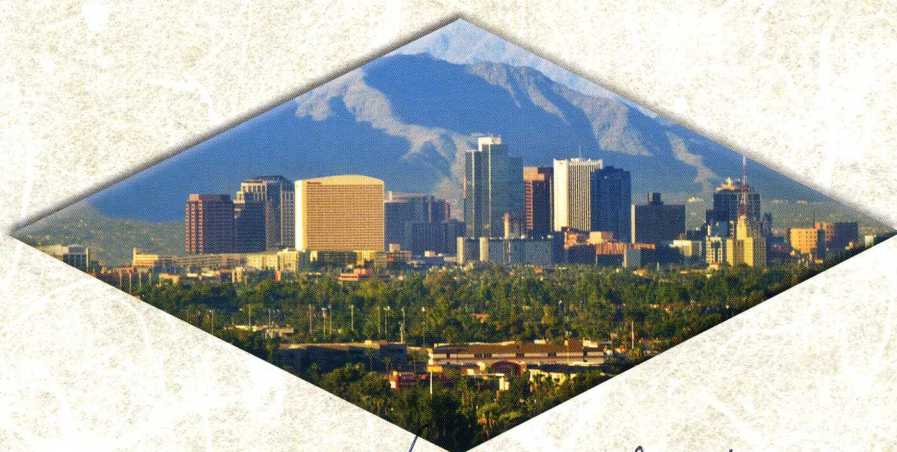


Academy of Osseointegration

27th Annual Meeting

Technology to Practice



Takao Watanabe
Phoenix

March 1-3, 2012

**Phoenix Convention Center
Phoenix, AZ**



**PROGRAM
GUIDE**



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Poster Presentation Abstracts

achieved with a combination of computer assisted surgical planning and guided Implant Insertion. Success requires a team approach between the surgeon, the restorative dentist, the laboratory and the patient.

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An Anatomical Study of the Maxillary Sinus and Dental Arch using ZAC Point on CT Images

T. Watanabe*, D. Yamauchi, T. Takahashi, K. Kawaguchi.

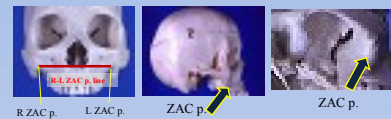
ZAC point (intersection between zygomatico-alveolar crest and the anterior margin of infratemporal fossa) is clinically important as a landmark for implant surgery with sinus lift procedure. In this study, morphological measurement of dental arch and maxillary sinus using the ZAC point were performed on CBCT images of implant patients. A total of 50 patients participated in the study: 15 male and 35 female, with an average age of 56, ranging from 31 to 71 in years. Their bilateral maxillary sinuses were the subject of this investigation. The CT scanner used was a Prevista (Japan Medical Material Ltd., Japan). CBCT DICOM data obtained this way were fed into a computer subsequently to be turned into MPR images by SimPlant Pro 11® (Materialise Dental Ltd., Belgium). Images so obtained were then adjusted in relation to the occlusal plane perpendicular to the plane composed of incisive foramen and hamular notch (pterygoid notch). Then morpho-anatomical measurements were taken of each dental arch and the maxillary sinus in reference to ZAC point defined as above. Average distance from ZAC point to occlusal plane was 29.4 ± 3.4 mm in height; average distance from the line connecting bilateral ZAC points to maxillary incisor 33.0 ± 2.6 mm antero-posteriorly; average distance from inter-ZAC point line to intercuspid line 23.8 ± 2.4 mm antero-posteriorly; and average distance from inter-ZAC point line to medial palatal cusp of first molar was 3.3 ± 0.3 mm antero-posteriorly. Additionally, average intercuspid distance was 56.6 ± 3.6 mm horizontally, while average distance from between mesial palatal cusps of bilateral first molars was 38.4 ± 2.6 mm horizontally. Reference points adopted in this study are as follows: ZAC point, incisive foramen, and pterygoid notch. Values obtained this way were fed into a commercially available version of CT implant simulation software in an attempt to devise an optimal tooth arrangement for the subject. Although there was an imbalance between male and female sample sizes in this study, it is probably reasonable to assume that a denture tooth arrangement is possible on CT implant simulation software images based on certain anatomical information.

An anatomical study of the maxillary sinus floor and dental arch using the ZAC point on CBCT images

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I . Introduction

ZAC point (ZAC p.) is an anatomical landmark located at the intersection between the outer line of the zygomaticoalveolar crest and the anterior margin of infratemporal fossa.



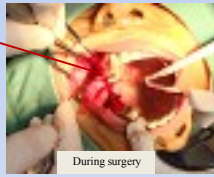
ZAC p. can be felt through the skin.



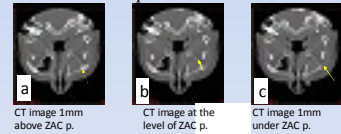
ZAC point can be visible inside the mouth and in panoramic X-ray photos.



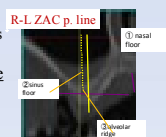
The line (R-L ZAC p. line) between right ZAC p. and left can close the maxillary sinus. ZAC p. is now in widespread use clinically as a landmark to indicate the maxillary sinus.



ZAC p. can also be seen in CBCT image.



The previous study showed that the usual operation area for sinus floor elevation surgery occurs at the sinus floor under the R-L ZAC p. line.



Distance in height from ZAC p.

	ZAC p. ①nasal floor	ZAC p. ②sinus floor	ZAC p. ③alveolar ridge
Average Height (mm)	4.3	11.1	16.2
SD	1	2	4
n	14	14	14

Purpose

The purpose of this study is to measure anatomically the maxillary sinus floor and dental arch using CBCT images and to consider the usefulness of ZAC p. as a landmark for maxillary sinus floor elevation in conjunction with implant placement.

II. Materials and Methods:

A total of 50 subjects participated in the study: 15 male and 35 female, with an average age of 56, ranging from 31 to 71 years old.

Their bilateral maxillary sinuses were the subject of this investigation.

The CT scanner : Prevista (Kyocera Medical co. Ltd., Japan, 100Kv, 150mA, 0.3mm in slice thickness, and a reconstitution interval of 0.1mm).

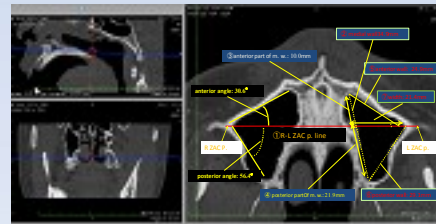
CBCT DICOM data obtained this way was fed into a computer subsequently to be turned into MPR images by SimPlant Pro 11® (Materialise Dental Ltd., Belgium).

Measurement A in axial view: sinus floor at the level of ZAC p. and dental arch

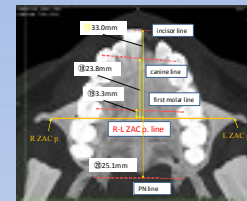
Measurement B in coronal view: sinus floor

III. Results

Measurement A in axial view : maxillary sinus floor at the level of ZAC p.

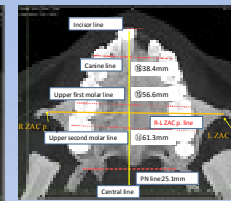


Anterior-posterior distance between maxillary teeth and R-L ZAC p. line

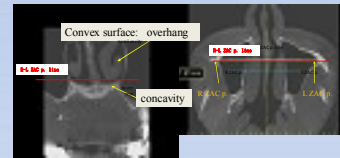


ZAC p. can indicate the position of upper teeth using data in relationship with anterior-posterior distance and right-left distance.

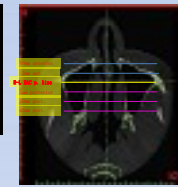
Width of maxillary dental arch using ZAC p. as a landmark



Measurement B in coronal view: maxillary sinus floor

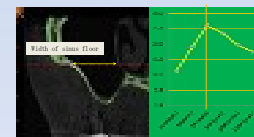


Nasal cavity appears a cylinder-form and it protrude in the maxillary sinus in coronal view. The medial wall protrudes in the sinus. It is composed of convex surface and concavity.



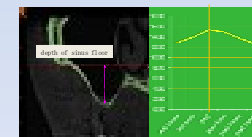
Measurements were performed in 5mm slices each from anterior part to posterior.

①Width of maxillary sinus floor in R-L ZAC p. line



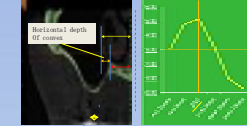
The width of maxillary sinus was 26.1 ± 1.7 mm, widest at the site of ZAC p. It was 10mm, narrowest at 10mm anterior to ZAC point.

②Depth of sinus floor until R-L ZAC p. line



The depth of sinus floor (distance between sinus floor and R-L ZAC p. line) was 15.3mm, deepest at the site of ZAC p. The usual size of implants is 10mm to 16mm in length. Accordingly, sinus floor under R-L ZAC p. line is usual site for sinus floor elevation.

③Horizontal depth of convex (concavity) in medial wall of sinus floor



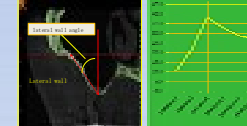
Horizontal depth of convex was 5.1mm, horizontally deepest at the site of ZAC p..

⑤Length of medial wall of sinus floor



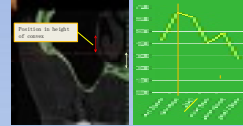
The length of medial wall of floor was 19.8 ± 4.4 mm, longest at the site of ZAC p.

⑦lateral wall angle at sinus floor



Lateral wall angle was $38.3 \pm 7.9^\circ$, largest at the site of ZAC p..

④Position in height of the convex (distance in height from R-L ZAC p. line)



The position of the convex in all sites was superior to R-L ZAC p. It was 6.5mm over, highest at the site of 5mm anterior to ZAC p.

⑥medial wall angle at sinus floor



Medial wall angle was 43.5° , largest at 5mm posterior to ZAC p..

Discussion continued
Measurement B in coronal view

At the site of ZAC p., the width of sinus floor was widest, the depth of sinus floor was deepest, horizontal depth of convex was horizontally deepest, the length of medial wall of the sinus floor was longest and lateral wall angle was largest.

This study showed that the site of ZAC p. was widest, deepest, longest and largest position in most indicators.

IV. Discussion

Measurement A in axial view

significant difference-Posterior part of maxillary sinus was deeper than anterior at the level of ZAC p.

correlation-There was strong correlation between the length of R-L ZAC p. line and width of right maxillary sinus (0.771), and left (0.746) at the level of ZAC point.

-There was also strong correlation between the length of medial wall and width of maxillary sinus (0.654).

-There was merely correlation between the length of R-L ZAC p. line and the width of maxillary first molars (0.270), and maxillary canines (0.292).

-There was also small correlation between the length of R-L ZAC p. line and anterior-posterior distance of incisor line (0.498) from R-L ZAC p. line, canine line (0.158) and first molar line (0.428).

-There was strong correlation between the length of R-L ZAC p. line and the width of maxillary sinus, but there was small correlation between width and length of dental arch.

V . Conclusion

At the level of ZAC p., the posterior part of maxillary sinus floor was longer than anterior.

There was strong correlation between the length of R-L ZAC p. line and the width of maxillary sinus, but there was merely correlation with width and length of dental arch.

The medial wall of the maxillary sinus is composed of convex surface and concavity. The site of ZAC p. was located at the widest, deepest, longest and largest sites of the maxillary sinus floor in most indicators.

ZAC p. can be useful as an anatomical landmark to indicate sinus floor structures and dental arch for maxillary sinus floor elevation in conjunction with implant placement.