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Assessment of the Relationship Between the Intraosseous Vascular Canal in the Lateral Wall of the Maxillary Antrum and Maxillary Posterior Teeth: A CBCT Study

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Abstract

Understanding the anatomical relationship between the intraosseous vascular canal (IOVC) located in the lateral wall of the maxillary sinus and posterior maxillary teeth is crucial for minimizing complications during surgical procedures such as sinus lift surgeries, implant placement, and other maxillofacial interventions. This study aimed to evaluate the spatial relationship between the IOVC and maxillary posterior teeth using cone-beam computed tomography (CBCT).

A retrospective analysis was performed on CBCT scans obtained from patients requiring radiographic evaluation of the posterior maxilla. Measurements included the presence, diameter, and vertical distance of the intraosseous vascular canal from the sinus floor and adjacent teeth. The findings demonstrated variability in canal position relative to posterior teeth, emphasizing the importance of preoperative radiographic evaluation.

The study concludes that CBCT provides reliable visualization of the vascular canal and its relationship with posterior teeth, thereby aiding in surgical planning and reducing the risk of hemorrhagic complications.

Keywords: CBCT, Maxillary sinus, Intraosseous vascular canal, Posterior teeth, Implant dentistry

Introduction

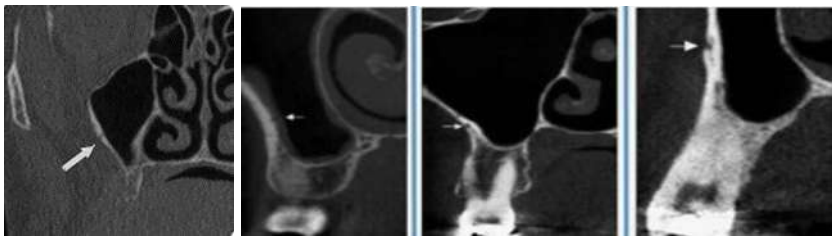
The maxillary sinus is an anatomically complex structure closely related to posterior maxillary teeth. Surgical procedures involving this region, particularly implant placement and sinus augmentation, require precise knowledge of vascular anatomy to prevent intraoperative complications such as haemorrhage.

The intraosseous vascular canal located within the lateral wall of the maxillary sinus carries branches of the posterior superior alveolar artery. Injury to this canal during surgical procedures can result in bleeding, compromised surgical visibility, and postoperative complications. Conventional radiography provides limited information regarding this anatomical structure, whereas CBCT offers three-dimensional visualization with high accuracy(Fig 1)

Therefore, assessing the relationship between the intraosseous vascular canal and posterior maxillary

teeth is essential for safe and predictable surgical outcomes.

Fig1- Radiographic picture of intraosseous vascular canals as visible in CBCT



Aim And Objectives

Aim

To assess the relationship between the intraosseous vascular canal in the lateral wall of the maxillary antrum and maxillary posterior teeth using CBCT.

Objectives

1. To determine the presence and course of the intraosseous vascular canal.

2. To measure the distance between the canal and the maxillary sinus floor.

3. To evaluate its relationship with maxillary posterior teeth.

4. To analyze variations based on gender and side distribution.

Materials And Methods

Study Design

A retrospective cross-sectional observational study.

Study Sample

CBCT scans of patients reporting for diagnostic imaging of the maxillary posterior region were analysed. Scans with pathology, trauma, or previous surgery affecting the sinus region were excluded.

Inclusion Criteria

1. Patients with fully erupted posterior maxillary teeth.
2. Clear visualization of maxillary sinus region on CBCT.
3. Age above 18 years.

Exclusion Criteria

1. Pathological lesions affecting sinus walls.
2. Previous surgical interventions in the sinus region.
3. Poor image quality.

Imaging Protocol

CBCT scans were obtained using standardized exposure parameters. Images were analyzed in sagittal, coronal, and axial planes to identify the intraosseous vascular canal.

Measurements

1. Presence or absence of canal.
2. Canal diameter.
3. Vertical distance from canal to sinus floor.
4. Relation to posterior teeth (premolars and molars).

Statistical Analysis

Data were analysed using appropriate statistical software. Descriptive statistics, mean values, and comparative tests were applied with significance level set at $p < 0.05$.

Results

The intraosseous vascular canal was identified in a significant proportion of CBCT scans, confirming its consistent anatomical presence. The canal showed variations in diameter and vertical position relative to the sinus floor.

The relationship between the canal and posterior teeth varied among individuals, with closer proximity observed in molar regions compared to premolars. Gender-based differences were minimal, although slight variations were noted in measurements between males and females(Fig2).

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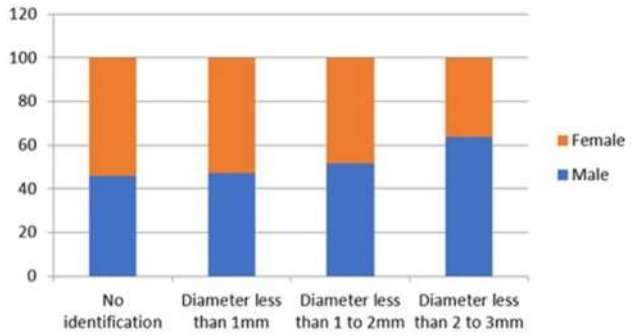
Fig 2 -Descriptive Statistics Data for Diameter wrt Gender

		Frequency												
Code	Category	Male	Female	Total	Mininimun a	Maximum	Range (Age Distr	Mean age in cat	Std. Deviatic	Variance	Interquartile Range	Skew	Kurtosis	Mean ± Std.
1	No identification	82	96	178	12	82	70	33.54	18.4	338.74	30.75	0.7	-0.81	33.54 ± 18.4
2	Diameter less than 1mm	34	38	72	14	64	50	31.93	14.21	201.9	21.25	0.79	-0.54	31.93 ± 14.21
3	Diameter less than 1 to 2mm	49	46	95	16	71	55	41.72	14.57	212.18	25	0.08	-1	41.72 ± 14.57
4	Diameter less than 2 to 3mm	14	8	22	27	70	43	47.91	10.74	115.42	8.25	-0.36	0.29	47.91 ± 10.74
		179	188	367										

Side-wise comparison revealed no statistically significant differences between right and left maxillary sinuses.(FIG3)

FIG 3-Illustration Of Correlation Of Diameter Of LAIC (Lateral antral intraosseous canal) With Age And Gender



Discussion

The findings of this study align with previous research indicating that the intraosseous vascular canal is commonly present within the lateral wall of the maxillary sinus and demonstrates considerable anatomical variability.

The proximity of the canal to posterior teeth is clinically relevant during sinus lift procedures and implant placement. Damage to the posterior superior alveolar artery can lead to bleeding complications that may compromise surgical outcomes. Therefore, accurate radiographic assessment is essential.

CBCT imaging proved to be highly effective in identifying the canal and measuring its relationship to surrounding structures, supporting its routine use in preoperative evaluation.

Conclusion

The intraosseous vascular canal in the lateral wall of the maxillary sinus shows significant anatomical variability in its position relative to posterior maxillary teeth. CBCT is a reliable diagnostic tool for evaluating this relationship and should be considered essential during preoperative planning to minimize surgical complications.

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