ASDJ
AINSHAMS DENTAL JOURNAL

Print ISSN 1110-7642
Online ISSN 2735-5039

AIN SHAMS DENTAL JOURNAL
Official Publication of Ain Shams Dental School
June2025 • Vol. 38

Relationship between blood group and amount of bone resorption

Zahraa Saad A karkosh[1] , Samer Salim Othman[2]
Eman Alaa Jaffer[3] , Mohammad Khursheed Alam[4]
Alyaa Saad Abed[5]

Aim: The aim of this study is to find relation of different type of blood group and frontal view on amount of vertical bone height.
Materials and methods: Sixty patients were selected in this study, taking types of blood group and measuring the amount of bone resorption after taking primary impression and pour it with dental stone with digital ruler.
Results: The data collected were analyzed using mean, Gabriel test and fisher test (LSD) the least significant differences, and the results showed that there was high significant effect of each blood group on anterior and posterior parts of maxillary and mandibular residual ridge.
Conclusion: There was a relationship between each blood groups and amount of bone resorption; however, there were no relation between bone resorption and types of blood groups.

Keyword: blood groups, digital ruler, residual ridge resorption

1. Prosthodontics, college of dentistry, Ibn-Sina University of medical and pharmaceutical sciences, Baghdad, Iraq.
2. Orthodontic Department\college of dentistry, Ibn-Sina University of medical and pharmaceutical sciences, Baghdad, Iraq.
3. Preventive dentistry, college of dentistry\Ibn-Sina University of medical and pharmaceutical sciences, Baghdad, Iraq
4. Orthodontics, Department of Preventive Dentistry, College of Dentistry, Jouf University, Sakakah, Saudi Arabia
5. Medical biotechnology\medical biotechnology department, College of Biotechnology, Al – Qasim Green University, Iraq.

Corresponding author: Samer Salim Othman, email: samerortho@ibnsina.edu.iq

Introduction

The residual ridge resorption (RRR) represents a remarkable oral condition that could lead to (physical, psychological, and financial) obstacles. However, RRR is refer to process occur to the bone after extraction of tooth which is unavoidable. There are main factors that contribute directly to RRR including: anatomical, functional, metabolic and prosthetic. [1] The process of bone loss most affects the crest of ridge on both side labial and lingual. [2] According to Atwood classification, there are six shapes. The process of RRR could change according to location, time and individuals. [3] The amount of bone resorption always be at the highest level during the first three to six months from extraction of tooth then continue through whole life but at slower level. [4]

The ABO Blood Groups System

There are thirty-three systems for blood groups classifications. [5, 6] These systems depended on number of genes that responsible to regulate the red blood cells which called blood groups, while the term blood type means a special response to antisera testing in specific system. According to many researches, there were many diseases have link to types of blood groups. Karl Landsteiner in 1900 discovers the ABO system based on study of serology. [7] Because this system considered one of the most significant systems; however, many different health issues found to be related to ABO system like hemostasis [8] , cerebral venous thrombosis [9] and cancer. [10]

Frontal View Determination:

Although, there are many methods to determine frontal view, but William's method still the most popular one due to its ability to classify the frontal view into oval, square and taper, also its ability to connect the relation of face shape to tooth shape which consider helpful method foe selection of prosthetic teeth in edentulous patients. [11]

Material and Methods

Sixty patients were involved in this study (who attended to teaching clinic at University of Ibn-Sina \ prosthodontics clinic); they were divided into three groups according to blood groups: group O, group A and group B. The AB blood group was excluded from this study as the data collected was only one patient. A primary impression was taken for both upper and lower jaws using impression compound material ,(Hoffmann's Germany) then poured with dental stone type III gypsum product (Elite Stone, Zhermack, Switzerland) to measure the height of residual ridge for each arch from anterior and posterior part by digital ruler.

Measuring method:

For upper anterior part lateral to labial frenum the measurement was done from crest of ridge to base of vestibule, for upper posterior part lateral to buccal frenum the measurement was done from crest of ridge to base of vestibule. As in figure 1.

Figure 1: represent method of measuring labial and buccal vestibule, A for upper anterior vestibule while B for upper posterior vestibule.

For lower anterior part lateral to labial frenum the measurement was done from crest of ridge to base of vestibule, for lower posterior part lateral to buccal frenum the measurement was done from crest of ridge to base of vestibule.
For measuring frontal view, six points were drawn on both sides of the patient's face, that refer to the greatest width on upper one third, middle third and lower third then joined these points to outline face.

Results

Descriptive analysis and statistical test were used to determine the effect of blood groups and frontal view on the amount of vertical bone height; the data collected were analyzed using Gabriel test. The results of ABO and square frontal view showed significant effect on upper anterior part, also there was a relationship of oval frontal view on lower posterior part of residual ridge. In addition to significant effect of all types of frontal view on lower posterior part of residual ridge of B blood group.

Table 1: Distribution of subjects by demographic date

		frequency	percentage
Age (years) (40-79,62.15±9.84)	40-49y	3	5.00
	50-59y	23	38.33
	60-69y	14	23.33
	70-79y	20	33.33
Gender	M	40	66.67
	F	20	33.33
Blood groups	A	20	33.33
	B	20	33.33
	O	20	33.33
Frontal view	Oval	23	38.33
	Square	19	31.67
	Triangle	18	30.00

Discussion

In this study, it had been found that there were some relationships between amount of vertical bone height that reflect amount of bone resorption with each type of blood group including (O, A and B); however, for AB excluded from this study due to only one patient found with this type of blood group which explain the rarity of this blood group among Iraqi dental patients.

The results of Table 2 shows that there was a significant relation between the square frontal view on amount of vertical bone height among all blood groups in upper anterior region with longest amount of bone in B blood group (12.85mm) and least amount of bone in O blood group (9.714mm).

Also, there was a significant relationship of oval frontal view with amount of bone height among all blood groups in lower posterior part of residual ridge, with longest bone height in A blood type (8.3mm) and least with B blood type (5.42mm).

However; for B blood group, it had been showed that there was a high significant relationship between frontal view and bone resorption with highest amount of bone in tringle view (7.66mm) and least with oval (5.42mm) in lower posterior region from residual ridge.

Table 2: Descriptive and statistical test of studied variables among blood groups and frontal view

		A		B		O		F	P value
Vars.	FV	Mean	±SD	Mean	±SD	Mean	±SD		
UP ant	Oval	11.000	1.155	11.000	2.160	10.000	1.789	0.792	0.467
	Square	11.200	2.387	12.857	1.464	9.714	1.704	5.214	**0.018**
	Triangle	10.000	1.581	11.833	1.169	10.000	2.000	2.469	0.118
	F	0.835		2.158		0.055			
	P value	0.451		0.146		0.947			
L ant	Oval	7.800	2.486	6.714	1.254	8.167	1.329	0.485	0.623
	Square	6.800	.837	7.571	2.507	7.286	1.799	2.224	0.141
	Triangle	7.000	1.871	8.500	1.225	7.571	1.397	0.646	0.538
	F	0.487		1.603		0.547			
	P value	0.623		0.230		0.588			
Up post	Oval	10.400	1.430	9.714	2.215	10.500	1.049	1.055	0.367
	Square	11.000	1.871	11.000	1.826	9.143	1.864	0.232	0.795
	Triangle	9.400	1.817	10.167	1.169	10.286	1.254	1.444	0.267
	F	1.230		0.897		1.702			
	P value	0.317		0.426		0.212			
L post	Oval	8.300	2.497	5.429	0.976	7.167	2.041	4.109	**0.032**
	Square	8.200	2.049	7.571	1.512	7.143	1.345	0.630	0.545
	Triangle	7.800	1.924	7.667	1.033	7.000	1.633	0.480	0.628
	F	0.082		7.479		0.020			
	P value	0.921		**0.005**		0.981			

- Red values represents significant difference

According to microscopic pathology, there are different ways for the process of (acanthosis, keratinization, edema, and a shift) in the shape of architectural changes in epithelium of oral mucosa in same oral cavity. There is various level of inflammation starting from dentate patient to removable denture wearers to those not use denture. [12-14] As explained previously the procedure of RRR can consider as multi-factors have effect on this process. [15]

According to the anatomic factors, small ridges subjected to more bone loss in vertical direction. [16]

Based on metabolic factors, the systemically factors and regional factors of bone resorption is changeable like the calcium and Vitamin D level [13] but the local loss of bone specially on crest of ridge made the local changes have important role in RRR. [14]

Table 3: Multiple pairwise comparison of studied variables among blood groups using Gabreil test

Dependent Variable	Frontal view	(I) Blood groups	(J) Blood groups	Mean Difference (I-J)	P value
UP ant	S	A	B	-1.657	0.348
			O	1.486	0.437
		B	O	3.143	**0.015**
L post	O	A	B	2.871	0.027
			O	1.133	0.629
		B	O	-1.738	0.353

•Red values represents significant difference

According to research of Wrinkle, this explained why the amount of bone resorption differs from one region to other in one arch. The lower anterior part of residual ridge was most resorbed probably due to small area situated between muscles of lip and muscles of tongue. [15]

However, these results could be explained that the amount of bone resorption in lower arch in all blood groups was higher than in upper arch due to type of bone and the smaller surface areas of lower arch comparing to the surface area of upper arch. Also for upper anterior region, the amount of bone resorption was lower than upper posterior region probably due to force of mastication on posterior region higher and its area of insertion of muscles. The results agreed with other studies showed that there were a relation between blood group and inflammation and immune response which in turn effect on the process of bone metabolism. [14- 17] However, other factors like forces of occlusion or metabolism nature of bone may consider more important factors that related to amount of bone resorption. Additional indicators involve more number of patients and sex may have effects for further study. [18]

For Lower posterior region, the results could be explained according to research done by Weinman and Sicherz that showed the reasons for bone loss like high pressure in the adjacent tissue, involved (the periosteum and the bone marrow), in addition to close effect of the elements of the blood and tissue fluid. [19] For Upper anterior region of upper arch between blood groups, the findings showed that there were a correlation between blood group types and the level of bone resorption in the upper anterior arch, also the systemic or genetic nature of a specific blood group might account for this type of bone resorption. These results could be useful in cases of dental implant treatment plan as people with blood group type O may need more follow up, more time for Osseo-integration process and reduce functional load on upper anterior region comparing to those with blood group type A or B. [20]

Upper posterior region, the data indicate that all types of groups showed insignificant effect and cannot be considered substantiated statistically. This

is probably due to the posterior region of the maxillary bone, which is made up of dense cortical bone structure, could resist resorption. [21-24]

One of the limitations of the presented study was the absence of patients, face photographs due to in ability to take approval from the patients to use their pictures for publications.

Table 4: Multiple pairwise comparison of lower posterior among frontal view in blood group B using Gabriel test

Blood groups	(I) Frontal view	(J) Frontal view	Mean Difference (I-J)	P value
B	O	S	-2.143	**0.012**
		T	-2.238	**0.011**
	S	T	-0.095	0.999

- Red values represents significant difference

Conclusion

This study showed that there was a relationship between some specific types of frontal view with blood groups and amount of remaining bone height.

Ethics approval:

This paper was confirmed to the ethical approval and rules and it was approved by the Institutional Review Board (IRB)- Ethical Committee at Ibn Sina University of Medical and Pharmaceutical Sciences which numbered by number ISU.18.1.24 on the 21st of December, 2024.

Funding information

There was no funding support for this work.

Conflict of interest:

The authors declare that there are no conflict of interest.

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