

Association of Residual Ridge Resorption with Age, Gender and Underlying Medical Conditions in Completely Edentulous Patients - A Retrospective Study

Research Article

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Abstract

Residual ridge resorption is based on multifactorial problem. This study aimed to assess the association between the age, gender, medical complications of the completely edentulous patient with the period of edentulism and the rate of residual ridge resorption. A total of 421 patients with completely edentulous status was selected in this study. The data were extracted from the digital software attending in a private hospital setup. The data extracted were based on the inclusion and exclusion criteria of the study. Most of the study population were male than females. The period of edentulism were between 2-5 years and more than 5 years. The residual ridge resorption was assessed based on the clinical photographs and radiographs. The results of the study revealed that there is a significant association of age, gender, medical complication, period of edentulism and ridge resorption with a p value of < 0.5. The results of the present study revealed that, most of the completely edentulous patient above 60 years had more medical complication, ridge resorption and period of edentulism. Males had more medical complications, ridge resorption than females. Ridge resorption is associated with the underlying medical complications and the period of edentulism. Better understanding of the medical history of the patient can determine the residual ridge resorption pattern.

Introduction

The bone tends to resorb when the tooth is removed which leads to residual ridge resorption. The pattern of resorption varies from maxilla to mandible, the maxillary width reduces whereas the mandibular width widens [2]. The resorption rate is rapid during the initial stage after extraction. The rate of resorption is more in maxilla than in mandible due to the quality of the bone [36]. The resorption of the ridge occurs from the labial cortical plate to lingual and eventually leads to the knife edged pattern of the ridge followed by low well rounded [15]. Alveolar ridge bounds the teeth in all directions and acts as an anchor to the teeth (tenuate). The stages of ridge resorption is characterised by Atwood as six orders. The initial order is before extraction, order 2 is post extraction, order 3 is high well rounded, order 4 is knife edged, order 5 is low well rounded and order 6 is depressed.

These stages of ridge resorption occur at different times after a tooth is removed [14].

The term for ridge resorption is residual ridge resorption (RRR) given by Atwood. It is a chronic, progressive and cumulative pattern of disease of the bone. The amount of RRR varies at different age groups and has multiple factors [29]. A severe RRR always leads to improper construction of the complete denture in completely edentulous patients and the treatment planning will become quite challenging to the dentist.

There are many factors for RRR and can be divided into two categories mainly: local factors and systemic factors. The quality, anatomy, size and shape of the ridge is categorised under localised factors whereas age, gender, systemic conditions, habits are categorised under systemic factors [15, 10]. During the menopause

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the oestrogen deficiency accelerates and leads to generalised mineral loss to the women. This loss of bone mass leads to RRR. The mandibular ridge resorption is more common in women than in men. Likewise, systemic factors also lead to RRR. Patients with osteoporosis encounter severe RRR with low bone density, thinning of the cortical plate. Many underlying systemic conditions like thyroid, hypertension, diabetes are the risk factors for osteoporosis and may lead to severe RRR. Habits such as alcoholism leads to deleterious effects on bone structure. Smoking is also a major risk factor for bone fracture and bone loss. Smoking and many periodontal diseases have an association and have been proved by many studies.

RRR may also occur with patients wearing dentures for a long period of time and patients with long term edentulism. There are many studies which have measured the RRR with different devices like cephalometric, OPG, calliper and VAS. Wical and Swoope determined initially with the help of orthopantomographic (OPG) [3, 4, 16]. OPG were used to analyze the location of different anatomical structures especially mental foramen with relation to the crestal level of the bone by many researchers to study the pattern of RRR according to different ages of the patients. Knowing the aetiology, metabolic factor, anatomical factor, systemic factor, pathogenesis of resorption, and the histological factors are available in the literature. However, there is a little knowledge in the association of age, period of edentulous, the systemic condition in association to the residual ridge resorption in the literature.

Previously our team has a rich experience in working on various research projects across multiple disciplines [18, 17, 26, 13, 9, 7, 21, 27, 20, 5, 37, 1, 11, 31, 33]. Now the growing trend in this area motivated us to pursue this project.

This study aims to assess the association between the different medical conditions, age gender of the completely edentulous patient and the rate of bone resorption seen clinically which will aid in proper treatment planning knowing the medical condition of the patients.

Materials And Methods

A single centre retrospective study was done in an institutional setting. The ethical approval was received from the institution's ethical committee. The study involved selected patients data who were completely edentulous and had undergone complete denture. The necessary approvals in gaining the datas were obtained from the institutional ethical committee (SDC/SIHEC/DIAS-

DATA/0619-0320). The number of people involved in this study includes 3 i.e guide, reviewer and researcher.

Selection of subjects:

All patients who had undergone in completely edentulous and had undergone complete denture from the time period of June 2019 to April 2020 were selected for this study. There were three people involved in this study (guide, reviewer, and researcher). All available data were taken into consideration and there was no sorting process.

Data collection:

The patient's details were retrieved from the institution's patient record management software (Dental Information Archiving Software). Data regarding patients age, gender, medical condition, period of edentulism were taken into consideration for this study. Cross verification of the data was done with the help of photographs and radiographs. The data was manually verified, tabulated and sorted.

Inclusion Criteria:

All patients were completely edentulous and had undergone complete denture. All age groups were taken into account.

Exclusion Criteria:

Patients' records that were incomplete were removed from the study. Repetitive entries were excluded as well.

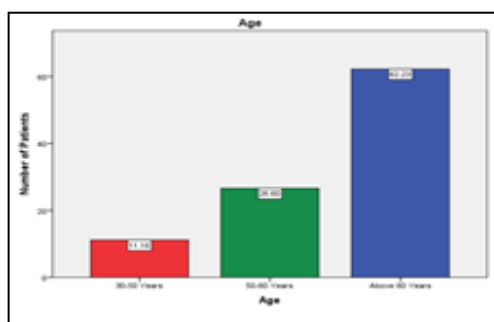
Statistical Analysis:

The tabulation of data was analysed using SPSS software. (IBM SPSS Statistics 26.0) The method of statistical analysis that was used in this study was Chi Square Test to compare two proportions. The analysis was done for: age, gender, medical condition, period of edentulism in this study.

Results & Discussion

The total population of the study was 421. The age distribution of the present study population is as follows - 11.16% were between 30-50 years of age, 26.60% were between 50-60 years of age and 62.23% were above 60 years of age (figure 1). In our study, 59.89% were males whereas 40.14% were females (figure 2). The

Figure 1: Shows the age distribution of the completely edentulous patients. X axis represents the age of the completely edentulous patient and Y axis represents the number of patients with complete denture. 11.16% were between 30-50 years of age (red), 26.60% were between 50-60 years of age (green) and 62.23% were above 60 years of age (blue).



medical complications associated with the edentulous patient in the present study revealed that 18.53% had hypertension, 26.37% had diabetes, 4.513% had Asthma, 8.797% had other systemic conditions, and 41.81% were disease free (figure 3). The edentulism status of the present study revealed that 24.70% had < than 1 year, 39.67% had 2-5 years, and 35.63% had > 5 years of period of edentulism (figure 4). The resorption status of the study revealed that 38% of the population had ridge resorption and 62% did not have ridge resorption (figure 5).

The association between the age and the medical complications revealed that 0.95%, 9.89%, 7.60% of hypertension was seen in the age group of 30-50 years, 50-60 years, above 60 years respectively. 0.41%, 4.04%, 21.62% of diabetes were seen in the age group of 30-50 years, 50-60 years, above 60 years respectively. 1.43%, 3.09% of Asthma were seen in the age group of 50-60 years, above 60 years respectively. 1.66%, 0.71%, 6.41% of other

complications were seen in the age group of 30-50 years, 50-60 years, above 60 years respectively. 7.84%, 10.45%, 23.52% of no medical complications were seen in the age group of 30-50 years, 50-60 years, above 60 years respectively. Chi square association was done and found to be statistically significant. Chi square value: 69.440, df value: 8, p value: 0.03 (< 0.05) (figure 6).

The association between the age and ridge resorption revealed that 1.66%, 12.83%, 23.52% of the patient between the age group of 30-50 years, 50-60 years, above 60 years respectively had residual ridge resorption whereas 9.50%, 13.78%, 38.72% of the patient between the age group of 30-50 years, 50-60 years, above 60 years respectively had no residual ridge resorption. Chi square association was done and found to be statistically significant. Chi square value: 15.615, df value: 2, p value: 0.000 (< 0.05) (figure 7).

The association between the age and period of edentulism re-

Figure 2: Shows the gender distribution of the completely edentulous patients. X axis represents the gender of the completely edentulous patient and Y axis represents the number of patients with complete denture. 59.89% were males (blue) whereas 40.14% were females (red).

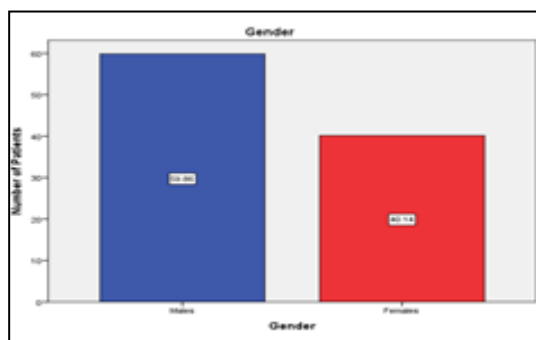


Figure 3: Shows the distribution of the medical complications of the completely edentulous patients. X axis represents the medical complications of the completely edentulous patient and Y axis represents the number of patients with complete denture. 18.53% had hypertension (red), 26.37% had diabetes (green), 4.513% had Asthma (blue), 8.797% had other systemic conditions (yellow), and 41.81% were disease free (grey).

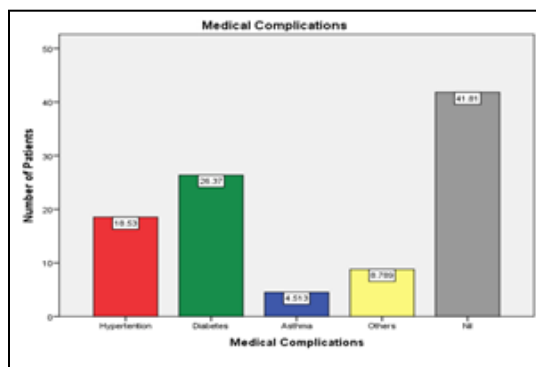


Figure 4: Shows the distribution of the period of edentulism of the completely edentulous patients. X axis represents the period of edentulism of the completely edentulous patient and Y axis represents the number of patients with complete denture. 24.70% had < than 1 year (red), 39.67% had 2-5 years (green), and 35.63% had > 5 years of period of edentulism.

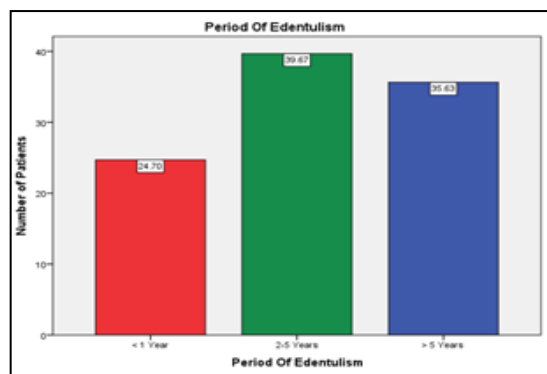


Figure 5: Shows the distribution of the presence of ridge resorption of the completely edentulous patients. X axis represents the presence of ridge resorption of the completely edentulous patient and Y axis represents the number of patients with complete denture. 38% of the population had ridge resorption (red) and 62% did not have ridge resorption (blue).

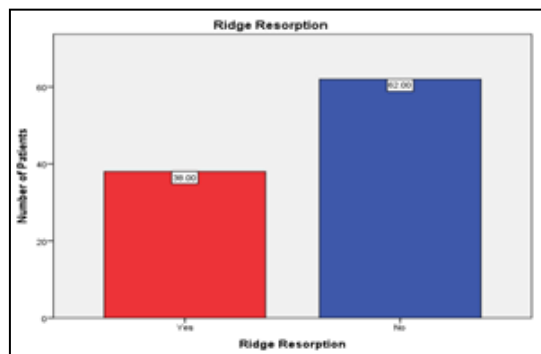


Figure 6: Shows the association between the age of the completely edentulous patient and the medical complications (hypertension, diabetes, asthma, others, nil). X axis represents the age of the patients and Y axis represents the number of patients with complete dentures. Chi square association was done and found to be statistically significant. Chi square value: 69.440, df value: 8, p value: 0.03 (< 0.05), hence proving that more medical problems are prevalent in the older age group and diabetes is the most common medical condition among denture wearers.

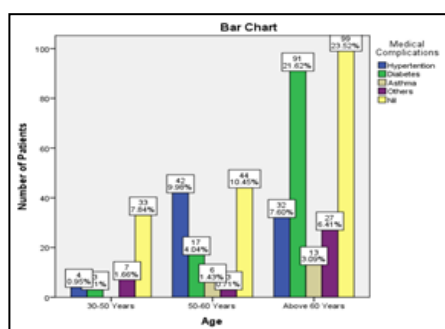


Figure 7. Shows the association between the age of the completely edentulous patient and the prevalence of ridge resorption. X axis represents the age of the patients and Y axis represents the number of patients with complete denture with ridge resorption. Chi square value: 15.615, df value: 2, p value: 0.000 (< 0.05), hence proving denture wearers above 60 years of age reported with less ridge resorption than other age groups.

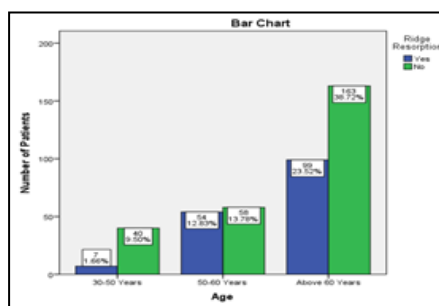
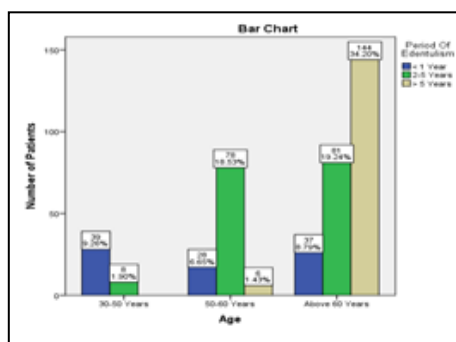


Figure 8. Shows the association between the age of the completely edentulous patient and the period of edentulism. X axis represents the age of the patients and Y axis represents the number of patients with complete denture with period of edentulism. Chi square association was done and found to be statistically significant. Chi square value: 186.032, df value: 4, p value: 0.020 (< 0.05), hence proving as the age increases the period of edentulism increases and more than 5 years is seen above 60 years.



veals that 9.26%, 6.65%, 8.79% had less than 1 years of period of edentulism within the age group of 30-50 years, 50-60 years, and above 60 years respectively. 1.90%, 18.53%, 19.24% of the completely edentulous patients had 2- 5 years of period of edentulism within the age group of 30-50 years, 50-60 years, and above 60 years respectively. 1.43%, 34.20% of the completely edentulous patients had more than 5myears of period of edentulism within the age group of 50-60 years, and above 60 years respectively. Chi square association was done and found to be statistically significant. Chi square value: 186.032, df value: 4, p value: 0.020 (< 0.05) (figure 8)

The association between the gender and the medical complications revealed that 13.05%, 5.46%, of hypertension was seen in males and females respectively. 15.91%, 10.45% of diabetes were seen in males and females respectively. 1.19%, 3.33% of Asthma were seen in males and females respectively. 5.23%, 3.56% of other complications were seen in males and females respectively. 24.47%, 17.34% of no medical complications were seen in males and females respectively. Chi square association was done and found to be statistically significant. Chi square value: 12.726, df value: 4, p value: 0.013 (< 0.05) (figure 9).

The association between the gender and ridge resorption revealed that 23.75%, 14.25% had ridge resorption between the males and females respectively. 36.10%, 25.89% had no ridge resorption between males and females respectively. Chi square association was done and found to be statistically not significant. Chi square value: 0.750, df value: 1, p value: 0.383 (> 0.05) (figure 10).

The association between the gender and period of edentulism reveals that 10.45%, 14.25% of males and females had less than

1 years of period of edentulism respectively.19.71%, 19.95% of males and females had 2- 5 years of period of edentulism 29.69%, 5.94% of males and females had more than 5 years of period of edentulism. Chi square association was done and found to be statistically significant. Chi square value: 54.905, df value: 2, p value: 0.00 (< 0.05) (figure 11).

The association between the medical complication and the prevalence of ridge resorption revealed that 7.36%, 13.30%, 2.61% 10.93% of patients with hypertension, diabetes, asthma, others, nil respectively had residual ridge resorption whereas 11.16%, 13.06%, 1.90%, 30.88% of patients with hypertension, diabetes, asthma, others, nil respectively had no residual ridge resorption. Chi square association was done and found to be statistically significant. Chi square value: 21.541, df value: 4, p value: 0.034 (< 0.05) (figure 12).

The association between period of edentulism of the completely edentulous patient and the prevalence of ridge resorption revealed that 5.23%12.59%, 20.19% had ridge resorption with < 1 year, 2-5 years, and > 5 years of period of edentulism respectively. 19.48%, 27.08%, 15.44% had no ridge resorption with < 1 year, 2-5 years, and > 5 years of period of edentulism respectively. Chi square association was done and found to be statistically significant. Chi square value: 37.491, df value: 2, p value: 0.04 (< 0.05) (figure 13).

The study results showed that most of the residual ridge resorption is based on the underlying medical complications. hypertension, diabetes and asthma had residual ridge resorption. Similar study done by Atwood had found significant association between the medical complication and ridge resorption. In the present

Figure 9: Shows the association between the gender of the completely edentulous patient and the medical complications (hypertension, diabetes, asthma, others, nil). X axis represents the gender of the patients and Y axis represents the number of patients with complete denture. Chi square association was done and found to be statistically significant. Chi square value: 12.726, df value: 4, p value: 0.013 (< 0.05), hence proving that more number of male denture wearers had medical conditions (diabetes, hypertension) than females.

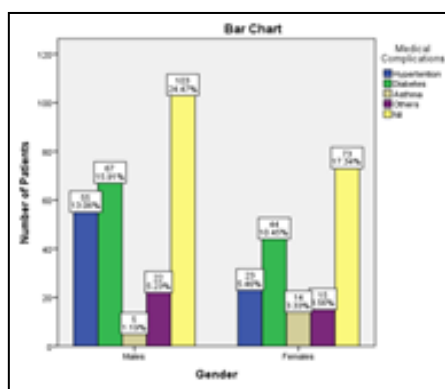


Figure 10: Shows the association between the gender of the completely edentulous patient and the prevalence of ridge resorption. X axis represents the gender of the patients and Y axis represents the number of patients with complete denture with ridge resorption. Chi square association was done and found to be statistically not significant. Chi square value: 0.750, df value: 1, p value: 0.383 (> 0.05), however more number of males had alveolar ridge resorption than females.

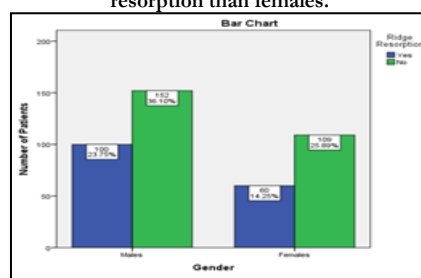


Figure 11: Shows the association between the gender of the completely edentulous patient and the period of edentulism. X axis represents the gender of the patients and Y axis represents the number of patients with complete denture with period of edentulism. Chi square association was done and found to be statistically significant. Chi square value: 54.905, df value: 2, p value: 0.00 (< 0.05), hence proving that more number of males were edentulous for a longer period of time (>5yrs) than females.

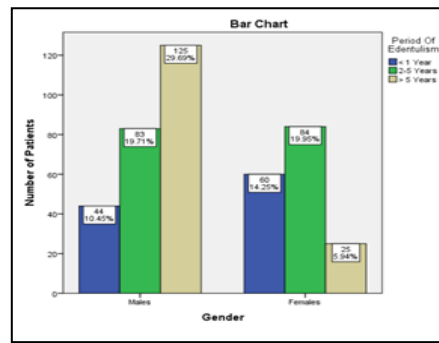


Figure 12: Shows the association between the medical complications of the completely edentulous patient and the prevalence of ridge resorption. X axis represents the medical complications of the patients and Y axis represents the number of patients with complete denture with ridge resorption. Chi square association was done and found to be statistically significant. Chi square value: 21.541, df value: 4, p value: 0.034 (< 0.05), proving that more ridge resorption occurs with underlying medical complications (hypertension, diabetes, asthma).

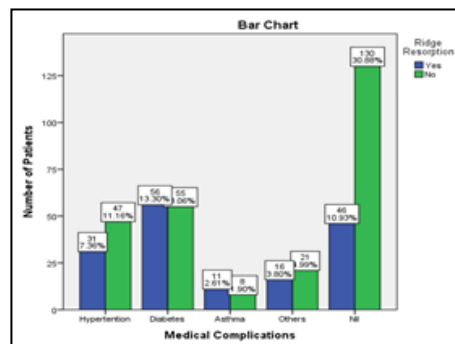
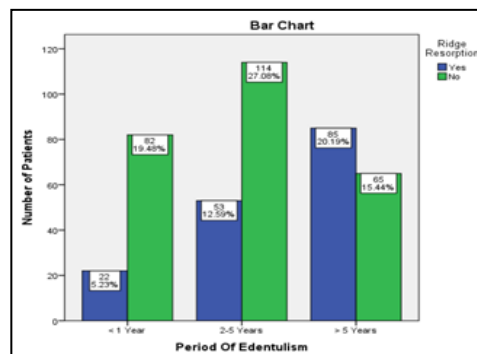


Figure 13: Shows the association between the period of edentulism of the completely edentulous patient and the prevalence of ridge resorption. X axis represents the period of edentulism of the patients and Y axis represents the number of patients with complete denture with ridge resorption. Chi square association was done and found to be statistically significant. Chi square value: 37.491, df value: 2, p value: 0.04 (< 0.05), proving that ridge resorption was more common among the patients with longer duration of edentulism.



study 2.61% had residual ridge resorption, this may be due to the consumption of the corticosteroids which reduces the quality of the bone. Many researchers have proved that there is an association between asthma and bone resorption [35].

In the present study the males had more residual resorption than females, however it was statistically significant. Females are subjected to the risk factor of osteoporosis after menopause stage[34]. Many studies have shown that the oestrogen deficiency affects the rate of resorption. The period of edentulism also is associated with residual ridge resorption. In our present study it is shown that the rate of resorption is predominantly seen in the patients with more than 5 years of edentulism. One of the studies done by Lopez proved that if the bone undergoes atrophy over

a period of time due to not being in use, there will not be any remodelling of bone occurring [30].

Our institution is passionate about high quality evidence based research and has excelled in various fields [19, 20, 8, 22, 28, 32, 6, 12, 24, 25]. We hope this study adds to this rich legacy.

Conclusion

The results of the present study revealed that, most of the completely edentulous patients above 60 years had more medical conditions and were edentulous for a longer period of time without opting for dentures. More number of males were edentulous for a longer duration,had medical conditions and ridge resorption

than females. Ridge resorption was associated with the underlying medical conditions and the duration of edentulism.

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