

Assessment of Residual Ridge Morphology among Edentulous Patients at A Tertiary Care Center of Nepal

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ABSTRACT

Background

The morphology of the residual ridge is one of the predominant factors influencing denture retention, stability, support and the masticatory function in edentulous patients thereby affecting both the planning and treatment prognosis. This study was aimed to assess the different types of maxillary and mandibular residual ridge in the group of edentulous population in Chitwan, Nepal.

Methods

A descriptive cross-sectional study was conducted in total of 107 completely edentulous patients within the age of 55-85 years' in Prosthodontic department of Chitwan Medical College. The type of maxillary and mandibular residual alveolar ridge in both male and female patients were noted in a predesigned proforma according to American College of Prosthodontists (ACP) classification system. The collected data was entered into Microsoft Excel and later transferred into SPSS version 26 and analyzed for descriptive statistics.

Results

In this study, 107 completely edentulous patients both male 63 (58.9%) and female 44 (41.1%) participated in the study. In the maxillary arch, Type B was most prevalent residual ridge type 55 (51.4%) whereas Type C in mandibular arch around 35 (32.7%). In male patients, Type B was most common 36 (57.1%) whereas Type A in female 20 (45.5%).

Conclusions

From this study it can be concluded that there is variation in the residual ridge. In maxillary arch, type B residual ridge was most prevalent followed by type A while in the mandibular arch type C was prevalent followed by type B.

Keywords: complete denture; edentulous; maxillary; mandibular; residual ridge.

INTRODUCTION

Complete denture rehabilitation of an edentulous patient has always remained a staple treatment option, predominantly affecting the oral health related quality of life.¹⁻³ Complete denture retention, stability, support, and masticatory performance in edentulous individuals profoundly depends on ridge shape. Therefore, it is crucial to understand both the quantity and quality of the accessible bone as it significantly helps to derive support for complete dentures.^{2,4,5} The amount of bone lost from the remnant alveolar ridge varies from patient to patient.^{4,6} The study of residual

ridge type is few in both maxillary and mandibular arch in Nepalese edentulous population, except one that has been done in maxillary arch.⁷ Thus this study was intended to carry out for assessing the type of maxillary and mandibular residual ridge morphology using the American College of Prosthodontists (ACP) classification system along with its relation to gender and the arch.

METHODS

This descriptive cross-sectional study was conducted from August 2023 to March 2024, in the Department of Prosthodontics & Maxillofacial Prosthetics of Chitwan

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Medical College. The ethical clearance for the research was approved by the Chitwan Medical College IRC (Reference no. CMC-IRC/079/080-224). Edentulous old age group of patients within 55-85 years of both genders, who consented to participate were included in the study. While patients who had recently undergone extraction with unhealed socket, any trauma/injuries in the premaxillary region and those patients who were under any medication affecting the gingiva were excluded from the study. Before initiating the study, the purpose of the study was explained to the patients, a written consent was taken followed recording the demographic details of the subjects in the predesigned proforma. Clinical evaluation of both the maxillary and mandibular residual ridge according to American College of Prosthodontists (ACP) classification system was then carried out.⁸ Patients were asked to sit in the dental chair. The intraoral examination was done in adequate light. To assess the residual ridge, the both sides of the cheek were distended apart and the type of ridge was noted. The collected data was entered into Microsoft Excel and later transported into SPSS version 26 and analyzed for descriptive statistics.

RESULTS

Total of 107 completely edentulous patients participated in the study in which 63 (58.9%) were males and rest 44 (41.1%) were females (Table 1).

Gender	Frequency (%)
Male	63 (58.9)
Female	44 (41.1)
Age (Mean ± S.D)	69.75 ± 8.60

In the study, Type B residual ridge was most prevalent in maxillary arch around 55 (51.4%) followed by Type A 44 (41.1%) whereas Type C in mandibular arch around 35 (32.7%) followed by Type B 30 (28%) (Table 2).

According to gender, Type B maxillary residual ridge was common in male 36 (57.1%) whereas Type A in female 20 (45.5%). In the mandibular arch, Type C was common in male 22 (34.9%) whereas Type D was dominant in female 14 (31.8%) (Table 3).

Type	Maxillary residual ridge n (%)	Mandibular residual ridge n (%)
A	44 (41.1)	15 (14)
B	55 (51.4)	30 (28)
C	4 (3.7)	35 (32.7)
D	4 (3.7)	27 (25.2)

Type	Maxillary residual ridge		Mandibular residual ridge	
	Male n(%)	Female n(%)	Male n (%)	Female n(%)
A	24 (38.1)	20 (45.5)	11 (17.5)	4 (9.1)
B	36 (57.1)	19 (43.2)	17 (27)	13 (29.5)
C	2 (3.2)	2 (4.5)	22 (34.9)	13 (29.5)
D	1 (1.6)	3 (6.8)	13 (20.6)	14 (31.8)

DISCUSSION

Conventional complete denture rehabilitation has undoubtedly remained as the first line of treatment for vast majority of completely edentulous patients. The successful outcome of the complete denture including denture retention, stability, support and masticatory efficiency predominantly rely on the shape and size of residual alveolar ridge.^{1,9} The quantity and quality of available bone dictates the amount of support that can be derived for the complete denture.⁷ Ridge resorption in both maxilla and mandible is high in the initial months of tooth extraction. This becomes slower in the later stages of edentulous life and ultimately affects ridge morphology.^{10,11} From a prosthodontic perspective, the residual ridge's (RR) morphology is the foremost predictor of the treatment outcome that impacts the patients' capacity to masticate and retain their complete dentures as well as their stability and support. Therefore, for a better understanding of residual ridge morphology, this study was set out to evaluate the type of residual ridge according to American College of Prosthodontists (ACP) classification system in both the maxillary and mandibular regions. McGarry et al. in 1999 published a classification system developed by American College of Prosthodontists (ACP) wherein the maxillary and mandibular ridge morphology have been clinically classified into Type A, B, C and D as diagnostic entity helpful in predicting complexity of treatment.^{7,8} Apart from the ACP classification, another classification of

residual ridge given by Cawood and Howell¹² has also been used by in many studies.^{1, 13} Sharma et al in their study showed prevalence of type A ridge followed by type B which was not in line with the present study where type B was prevalent followed by type A.⁷ Although Sharma et al⁷ performed their study only in maxillary ridge, the present study was done in both maxillary and mandibular ridges. In the present study, type C was prevalent in mandibular residual ridge followed by type B. Gupta et al in their study also showed similar findings in line with present study.⁴ Studies have shown variation in the morphology of both maxillary ridge and mandibular ridge. The variation that existed can also be defined on the basis of geographical region, number of the study participants and the length of data collection. According to gender, Type B maxillary residual ridge was common in male 36 (57.1%) whereas Type A in female 20 (45.5%), however, Sharma et al showed no gender wise association of maxillary ridge morphology among edentulous patients.⁷ As residual ridge resorption is a continuous process, the type of residual ridge is significantly associated with duration of edentulism. In the growing individual, the bone formation is in active stage while with aging the bone resorption becomes active. These are also influenced by many factors such as hormones, stress, diseases associated with aging and gender.^{10, 14, 15} With increase in duration ridge type may change. However, this study showed only the type of ridge at a particular point of time regardless of duration.

Al-Jabrah and Al-Shumailan reported an association between the pattern of alveolar bone resorption and the time period of complete dentures wear.¹⁶ This was also supported by another study performed in Japanese elderly women where longer period of edentulousness was associated with more resorption of bone than the shorter period of edentulousness.¹⁷ The study also has limitations. The small sample size of this study dictates further studies to be conducted in multiple centers while conduction of the study in single center also restricts on the generalizability of the study to the entire population of Nepal. Literatures have shown mixed results regarding various factors associated with ridge loss, duration of edentulism being the predominant element. However, this study focused on shape and size of residual at a point of time. The authors also did not take into account regarding the time period of edentulism as this may lead to recall bias.

CONCLUSIONS

On the basis of ACP classification, it can be concluded from this study that in maxillary arch, type B residual ridge was most prevalent followed by type A while in the mandibular arch type C was prevalent followed by type B. Though it do not represent the whole population but it may be helpful in treatment planning by predicting the outcome according to the type of residual ridge.

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REFERENCES

1. Alshenaiber R, Cowan C, Barclay C, Silikas N. Analysis of Residual Ridge Morphology in a Group of Edentulous Patients Seeking NHS Dental Implant Provision-A Retrospective Observational Lateral Cephalometric Study. *Diagnostics (Basel)* 2021;11(12). [[Google Scholar](#)][[DOI](#)]
2. Pham NQ, Gonda T, Maeda Y, Ikebe K. Average rate of ridge resorption in denture treatment: A Systematic Review. *J Prosthodont Res* 2021;65(4):429-37. [[Google Scholar](#)][[DOI](#)]
3. Huang HL, Tsai HL, Wu YL, Hsu JT, Wu AY. Biomechanical Evaluation of Bone Atrophy and Implant Length in Four Implants Supporting Mandibular Full-Arch-Fixed Dentures. *Materials (Basel)* 2022;15(9). [[Google Scholar](#)][[DOI](#)]
4. Gupta R, Gupta B, Gupta M, Dua B. Analysis in Variation in Ridge Morphology in Edentulous Adults. *Journal of Advanced Medical and Dental Sciences Research* 2018;6(9):5-7. [[Google Scholar](#)][[DOI](#)]
5. Hasegawa Y, Minakuchi H, Nishimura

- M, et al. Effect of soft denture liners on complete denture treatments: A systematic review. *J Prosthodont Res* 2024. [[Google Scholar](#)][[DOI](#)]
6. Acharya S, Lohe VK, Bhowate RR. Evaluation and comparison of alveolar bone loss of maxilla and mandible in completely edentulous patients on digital panoramic radiographs. *Journal of Oral Medicine, Oral Surgery, Oral Pathology and Oral Radiology* 2016;2(3). [[Google Scholar](#)][[DOI](#)]
 7. Sharma R, Bhojhibhoya A, Acharya B, Rana SB. Clinical Evaluation of Residual Ridge Morphology of Maxillary Arch in Relation to Ageing and Length of Edentulism. *Journal of College of Medical Sciences-Nepal* 2019;15(4):230-34. [[Google Scholar](#)][[DOI](#)]
 8. McGarry TJ, Nimmo A, Skiba JF, et al. Classification system for complete edentulism. *Dent Today* 2001;20(10):90-5. [[Google Scholar](#)][[DOI](#)]
 9. Stumbras A, Kuliesius P, Januzis G, Juodzbalys G. Alveolar Ridge Preservation after Tooth Extraction Using Different Bone Graft Materials and Autologous Platelet Concentrates: a Systematic Review. *J Oral Maxillofac Res* 2019;10(1):e2. [[Google Scholar](#)][[DOI](#)]
 10. Heersche JN, Bellows CG, Ishida Y. The decrease in bone mass associated with aging and menopause. *The Journal of prosthetic dentistry* 1998;79(1):14-16. [[Google Scholar](#)][[DOI](#)]
 11. Tallgren A. The continuing reduction of the residual alveolar ridges in complete denture wearers: a mixed-longitudinal study covering 25 years. *Journal of Prosthetic Dentistry* 2003;89(5):427-35. [[Google Scholar](#)][[DOI](#)]
 12. Cawood JI, Howell RA. A classification of the edentulous jaws. *Int J Oral Maxillofac Surg* 1988;17(4):232-6. [[Google Scholar](#)][[DOI](#)]
 13. Ribeiro JA, de Resende CM, Lopes AL, Farias-Neto A, Carreiro AdF. The influence of mandibular ridge anatomy on treatment outcome with conventional complete dentures. *Acta Odontológica Latinoamericana* 2014;27(2):53-57. [[Google Scholar](#)][[DOI](#)]
 14. Venkatesan N, Thenmozhi N, Udhayan A, Raghunathan J. Analysing the residual ridge morphology and resorption for treatment of edentulous patient with complete denture in Melmaruvathur population. *Int. J Rec Sci Res* 2018;9:25529-32. [[Google Scholar](#)][[DOI](#)]
 15. Abdulhadi LM, Saad K. Residual alveolar ridge resorption in completely edentulous patients influenced by pathophysiologic factors. *Dentika: Dental Journal* 2009;14(1):29-36. [[Google Scholar](#)][[DOI](#)]
 16. Al-Jabrah O, Al-Shumailan Y. Association of complete denture wearing with the rate of reduction of mandibular residual ridge using digital panoramic radiography. *Int J Dent Res* 2014;2(1):20-25. [[Google Scholar](#)][[DOI](#)]
 17. Taguchi A, Sueti Y, Ohtsuka M, et al. Relationship between bone mineral density and tooth loss in elderly Japanese women. *Dentomaxillofacial Radiology* 1999;28(4):219-23. [[Google Scholar](#)][[DOI](#)]

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