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Trends of Implant Placement in Relation to Crestal Bone Level in a Private Dental Institute

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ABSTRACT

Dental implants provide a strong foundation for fixed or removable prosthetic teeth that are made to match natural dentition. It has become an ideal method of oral rehabilitation after missing natural dentition has been recognised as a reliable tool for dental reconstruction and aesthetics. Marginal bone loss is characterized by a reduction in bone loss is characterized by a reduction in bone level both vertically and horizontally. The levels at which dental implants are placed include sub-crystal, equi-crestal, and supra-crestal. The crestal levels affect bone height significantly. Failure to do so will lead to peri-implant bone loss which will affect the implant function and ultimately implant failure. A retrospective study was conducted based on a university setting. 615 patients with 1141 implant sites were reviewed from June 2019 to March 2020. Excel tabulation and SPSS analysis were done for data analysis. There was a statistically significant difference between the variables that included tooth region, crestal relation and site (jaw)—[p-value<0.05] The most common crestal relation of implant placement is equi-crestal implant placement. The assessment of trends of implant placement in relation to crestal bone level shows that equi-crestal implant is the most preferred crestal relation of implant placement in Saveetha Dental College.

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INTRODUCTION

Dental implants are defined as prosthetic devices made of alloplastic material implanted into the oral tissues beneath the mucosal and/or periosteal layer and/or within the bone to provide retention and support for a fixed or removable dental prosthesis (Intitute and National Cancer Institute, 2020). It has become an ideal method of oral rehabilitation after missing natural dentition has been recognised as a reliable tool for dental reconstruction and aesthetics. Evaluation of circumferential bone loss around dental implants by using periapical radiographs has been commonly used in clinical prac-

tice to prevent postoperative complications and to ensure long-term prognosis. Marginal bone loss is a multifactorial etiology affected by surgical and prosthetic variables (Machado *et al.*, 2018). The surgical factors include insufficient crestal width, implant malpositioning, bone overheating during implant site preparation, implant crest module characteristics and excessive cortical compression. Prosthetic variables include the type of implant and abutment connection, entity and location of the implant and abutment micro gap, number of abutment disconnections, abutment height, residual cement and early loading (Abrahamsson and Berglundh, 2006).

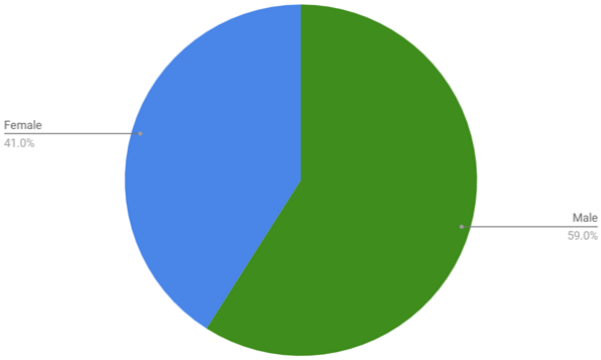

Figure 1: Green represents the male population(59.0%), and blue represents the female patients (41.0%)

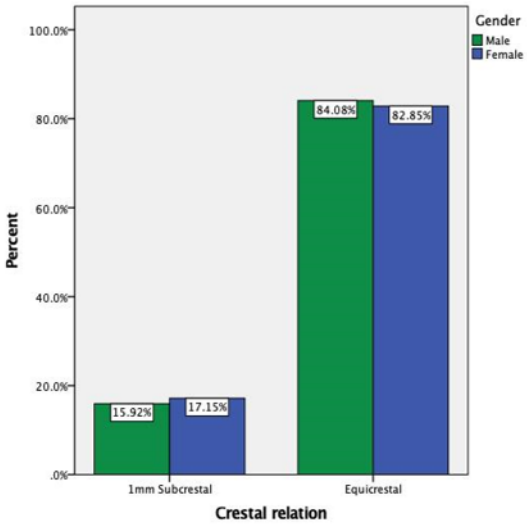

Figure 2: The X-axis shows the crestal placement and the Y-axis represents the percentage of males and females

A dental implant has two connections. Internal and external. The external connection implants are connected to the abutment externally through the attachment screw. (Ashok, 2014; Venugopalan *et al.*, 2014; Balaji and Gajendran, 2018) The implant is not completely inserted into the bone (Ganapathi *et al.*, 2017; Jain, 2017) The internal connection implants are designed with a shape that allows the abutment that joins the implant and the prosthesis to be inserted a few millimetres inside the implant itself. This type of connection provides stability and sealing to the implant and prosthetic union (Caswell and Clark, 1991). The force transmitted is also equally distributed.

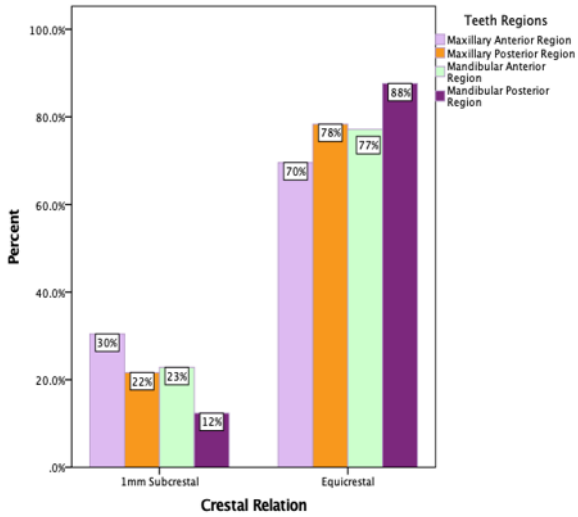

Figure 3: Y-axis denotes the percentages of cases in the respective teeth regions and X-axis denotes the crestal relationship

There are three levels of implant placement. They include supracrestal equi-crestal and subcrestal. Supracrestal implants are positioned 0.5mm to 1mm above bone crest (Gultekin *et al.*, 2016). Subcrestal; implants are placed 0.5mm to 3.4 mm below the bone crest. Equi-crestal implants are placed at the level of bone (Spinato *et al.*, 2019). Previously our department has published extensive research on various aspects of prosthetic dentistry (Vidhya and Nesappan, 2016; Madhavan and Gajnedran, 2018; Janani and Gajendran, 2018). This vast research experience has inspired us to research this topic. This study will provide a statistical report on crestal level of implant placement. (Venugopalan *et al.*, 2014) The aim of this study is to analyze the implant placement in relation to crestal level among implant practitioners in Saveetha Dental College. (Ashok and Ganapathy, 2019; Duraisamy, 2019)

MATERIALS AND METHODS

A retrospective hospital-based study was conducted at the Department of Implantology, Saveetha Dental College, Chennai, South India. All patients who had undergone implant surgery were identified and included in the study. The data was collected from the hospital database and clinical records between the time period of June 2019 to March 2020.

Table 1: The relationship between the crestal placement and region of implant placement

Site	Crestal relationship of implants (n=1141)		Chi-square Value	P-value
	Equicrestal (%)	1mm Subcrestal (%)		
Maxilla (%)	20.7	79.3	7.768	0.005*
Mandible (%)	14.3	85.7		
Total (%)	16.5	83.5		

Patients who had incomplete data were excluded from the study. Data concerning the age and sex of the patient, site of implant placement and their crestal position at the time of implant placement were recorded. The collected data were cross-verified by another investigator to avoid investigator bias. Sampling bias was minimized by evaluation of the photographs in the database. Data were analyzed using SPSS software (IBM SPSS Statistics, Version 24.0, Armonk, NY: IBM Corp). Descriptive statistics were used for the data summarization. Chi-square test was used to test the relationship between the variables. The level for a statistical significance was set at a value $p<0.05$.

RESULTS AND DISCUSSION

A total of six hundred and fifteen patients were included in the study with a predominantly male population (59%) (Figure 1). They had a total of one thousand one hundred and forty-one implant sites. 622 of the sites belonged to male patients, and 519 belonged to female patients. The mean age of the patients was 39.90□12.55. Among males,15.9% of the implants were placed 1mm below the crest of the bone, whereas it was 17.1% in females. 84%.1% of the implants were placed at the level of the crest of the bone in males and 82.9% in females (Figure 2), Green bars represent males, and the blue bars represent females. A total of 391 implants were placed in the maxillary region compared to 750 implants in the mandibular region. Implants were placed more frequently in the mandibular region compared to the maxillary region. There was a statistically significant difference between the crestal placement of implants and region of implant placement, specifically in the lower mandibular molar region (Table 1). In the different teeth regions, subcrestal placement of implants was the highest in the maxillary anterior region (30%) among all the regions and in the mandibular molar region, equi crestal placement of implants was the highest (88%) (Figure 3).

In our study, we found that dental implants were most commonly placed at the equi-crestal level in the mandibular jaw (67.5 %). This can be due to the type of implants used and the available bone height in the patient's jaw bone. Based on a contradictory study by Sotto- Maior, certain types of implants that are placed at subcrestal level produce less stress and strain than that placed equi-crestally (Sotto-Maior *et al.*, 2014). This report is contradictory to our study as the type of implant and bone height of the patient are different.

Figure 3 shows that the placement of dental implants in the lower molars are most common. This may be due to bone quality and quantity. The mandibular jaw has a denser bone than the maxilla. This can provide favourable outcomes in the long run for the patient as well as the implantologist. There are many factors that can lead to crestal bone loss post-implant placement. According to (Jimbo and Albrektsson, 2015) a combined factor syndrome explains the reasons behind crestal bone loss which include implant factors, clinical handling, and patient factors (Jimbo and Albrektsson, 2015).Those three factors contribute to crestal bone loss independently or as a combination. This syndrome, in theory, recognises known and published issues related to implant design, implant roughness, failures of marginal bone loss depending on either the clinician or the patient, which can be attributed to genetic and/or environmental factors (Albrektsson, 2001).

Bone width is very crucial in implant placement in terms of aesthetics, especially in the anterior region. The minimum available bone width should be more than 1 mm on either side of the implant faciolingually to keep the soft tissue levels stable. This is critical on the facial side since any bone resorption, and the ensuing change in the position of the gingival margin will be non-aesthetic. Deficiency in crestal bone width can compromise the adjacent teeth and soft tissue health. Bone loss can also cause recession of the soft tissues around the implant creating displeasing aesthetics. Furthermore, crestal bone loss can compromise the contours of future implant-prosthetics restoration, if any as well as the loss of papilla and flattening of tissues (Forna and Agop-Forna, 2019). There are many studies conducted on this topic that can relate to the findings of this study. According to a similar study conducted by (Pellicer-Chover *et al.*, 2019) bone loss

was more commonly experienced in implants placed subcrestal compared to those placed at an equi-crestal level. Other studies have also been conducted regarding the crestal levels; however, contradictory results were obtained. According to De Siquiera et al., different implant placement depths do not influence crestal bone changes (de Siqueira *et al.*, 2017). According to Marco Degidi et al., the subcrestal position of dental implants resulted in the excess bone located above the implant shoulder (Degidi *et al.*, 2011). A review about the impact of crestal and subcrestal implant placement by Pellicer and team, however, found that there was no significant difference in terms of outcome between crestal and subcrestal implant placement (Pellicer-Chover *et al.*, 2019). The limitations of this study were that the required data was specific and did not provide any follow-up data. Future scope of research would be aimed at developing long term prospective follow up studies to evaluate the bone loss in both groups.

CONCLUSION

Within the limits of this study, the assessments of the trends of implant placement in relation to crestal bone level show that equi-crestal implant placement is the most preferred crestal relation of implant placement and 88% of all equi crestal placement was done in the mandibular molar region.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

REFERENCES

Abrahamsson, I., Berglundh, T. 2006. Tissue Characteristics at Microthreaded Implants: An Experimental Study in Dogs. *Clinical Implant Dentistry and Related Research*, 8(3):107–113.

Albrektsson, T. 2001. Is surgical skill more important for clinical success than changes in implant hardware? *Clinical Implant Dentistry and Related Research*, 3(4).

Ashok, V. 2014. Lip Bumper Prosthesis for an Acromegaly Patient: A Clinical Report. *The Journal of Indian Prosthodontic Society*, pages 279–282.

Ashok, V., Ganapathy, D. 2019. A geometrical method to classify face forms. *Journal of Oral Biology and Craniofacial Research*, 9(3):232–235.

Balaji, S., Gajendran, P. 2018. Correlation of Gingival Thickness with Gingival Width, Probing Depth and Papillary Fill in Mandibular Anterior Teeth. *Research Journal of Pharmacy and Technology*, 11(9):3918–3918.

Caswell, C. W., Clark, A. E. 1991. Dental Implant Prosthodontics. *Dental Implant Prosthodontics*.

de Siqueira, R. A. C., Fontão, F. N. G. K., de Mattias Sartori, I. A., Santos, P. G. F., Bernardes, S. R., Tiossi, R. 2017. Effect of different implant placement depths on crestal bone levels and soft tissue behavior: a randomized clinical trial. *Clinical Oral Implants Research*, 28(10):1227–1233.

Degidi, M., Perrotti, V., Shibli, J. A., Novaes, A. B., Piattelli, A., Iezzi, G. 2011. Equicrestal and Subcrestal Dental Implants: A Histologic and Histomorphometric Evaluation of Nine Retrieved Human Implants. *Journal of Periodontology*, 82(5):708–715.

Duraisamy, R. 2019. Compatibility of Nonoriginal Abutments With Implants: Evaluation of Micro gap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments. *Implant dentistry*, 28(3):289–295.

Forna, N., Agop-Forna, D. 2019. Esthetic aspects in implant-prosthetic rehabilitation. *Medicine and Pharmacy Reports*, 92:S6–S13.

Ganapathi, A., Kannan, Venugopalan 2017. Awareness and knowledge about implants in complete denture: patient's survey. *International Journal of Approximate Reasoning*, 5:1806–1810.

Gultekin, B. A., Sirali, A., Gultekin, P., Ersanli, S. 2016. Clinical evaluation of the stability of implants placed at different supracrestal levels. *Journal of Istanbul University Faculty of Dentistry*, 50(3):21–21.

Intitute and National Cancer Institute 2020. Dental Implant.

Jain, A. R. 2017. Clinical and Functional Outcomes of Implant Prostheses in Fibula Free Flaps. *World Journal of Dentistry*, 8(3):171–176.

Janani, Gajendran, P. L. 2018. Anti–Plaque Efficacy of cure next Gel, Hoira-sa gel in Comparison with Chlorhexidine Gel. A Randomised Control trial Study. *Research Journal of Pharmacy and Technology*, 11(8):3689–3689.

Jimbo, R., Albrektsson, T. 2015. Long-term Clinical Success of Minimally and Moderately Rough Oral

Implants. *Implant Dentistry*, 24(1):62–69.

Machado, A. H., Fardim, K. A. C., de Souza, C. F., Sotto-Maior, B. S., Assis, N. M. S. P., Devito, K. L. 2018. Effect of anatomical region on the formation of metal artefacts produced by dental implants in cone beam computed tomographic images. *Dentomaxillofacial Radiology*, 47(1):20170281–20170281.

Madhavan, S., Gajnedran, P. L. 2018. A Preliminary Study to compare The Pain Perception of Topical gel Versus Injected Local Infiltration/Block Anaesthesia during Non-Surgical Periodontal Therapy. *Research Journal of Pharmacy and Technology*, 11(10):4257–4257.

Pellicer-Chover, H., Diaz-Sanchez, M., Soto-Penaloza, D., Penarrocha-Diago, M. A., Canullo, L., Penarrocha-Oltra, D. 2019. Impact of crestal and subcrestal implant placement upon changes in marginal peri-implant bone level. A systematic review. *Medicina Oral Patología Oral y Cirugia Bucal*, 24(5):0–0.

Sotto-Maior, B. S., de Andrade Lima, C., Senna, P. M., de Villa Camargos, G., Cury, A. A. D. B. 2014. Biomechanical evaluation of subcrestal dental implants with different bone anchorages. *Brazilian Oral Research*, 28(1):1–7.

Spinato, S., Stacchi, C., Lombardi, T., Bernardello, F., Messina, M., Zaffe, D. 2019. Biological width establishment around dental implants is influenced by abutment height irrespective of vertical mucosal thickness: A cluster randomized controlled trial. *Clinical Oral Implants Research*, 30(7):649–659.

Venugopalan, S., Ariga, P., Aggarwal, P., Viswanath, A. 2014. Magnetically retained silicone facial prosthesis. *Nigerian Journal of Clinical Practice*, 17(2):260–260.

Vidhya, G., Nesappan, T. 2016. A piezoelectric surgery for direct sinus lift with immediate implant placement. *Journal of Dental Implants*, 6(2):79–79.