



THE ASSOCIATION OF FLAP DESIGN AND WOUND HEALING AFTER IMPLANT PLACEMENT.

Inchara. R¹, Subhasree. R^{2*}, Thiyaneswaran N³

Article History: Received: 12.12.2022

Revised: 29.01.2023

Accepted: 15.03.2023

Abstract

Background:-Soft tissue healing around implants has become a focus of attention because it plays a central role in esthetic outcomes. Recovery of the peri-implant soft tissue occurs similarly to that against a tooth after a surgical procedure. This study aims at the association of flap design and wound healing after implant placement.

Materials and methods: It is a single centred retrospective study conducted at Saveetha dental college and hospitals, Chennai. Three hundred ninety-two patients who underwent implant placement, predominantly South Indians, were included in the study. The collected data were tabulated under the following parameters - name, age, gender, flap design and wound healing. The data analysis was performed using SPSS software (version 23). The chi-square test and Pearson correlation were done. The chi-square test was used to compare the data and checked for the distributions at 0.05 level of significance for the effect of statistical significance.

Results:-The study results showed an association between gender and wound healing, males had better-wound healing compared to females, and younger adults had better-wound healing, and the patients with full-thickness flap had better-wound healing and were statistically significant ($p < 0.005$)

Conclusion: Within study limits, it was concluded that patients with full thickness flap had better wound healing and association was found to be statistically significant.

Keywords: Implant placement; Flap Design; Wound Healing, Innovation

¹Saveetha Dental College and Hospitals Saveetha Institute of Medical and Technical Sciences Saveetha University Chennai.

^{2*}Senior Lecturer Department of Prosthodontics Saveetha Dental College and Hospitals Saveetha Institute of Medical and Technical Sciences Saveetha University

³Professor and Head, Department of Implantology, Saveetha Dental College and Hospitals Saveetha Institute of Medical and Technical Sciences Saveetha University Chennai.

DOI: 10.31838/ecb/2023.12.s2.143

1. Introduction

Dental implants are a widely used treatment option in dental clinics with very high long-term success rates; however, they are not free of complications (1). However, besides these biological and biomechanical complications of the direct cause, there are different clinical complications linked to the non-use of classical knowledge in implantology and periodontology. Today, these complications, especially in the esthetic area, can be reduced thanks to the new digital tools at our disposal (2).

In comparison to other surgical wounds, wound healing in oral mucoperiosteal tissues following surgery is unusual (3). The design of the flaps is crucial in this process. Furthermore, dental implant surgery offers the possibility of bridging the gap between a vascular soft-tissue surface and an avascular root surface. The need for healthy, integrated, and aesthetically acceptable soft tissue around the implant drives the importance of flap design (4). Tissue incision and reflection are used in all dental implant placement procedures to expose the bone for dental implant osteotomy and placement (5). The flap or soft tissue closure operation is the last step in the dental implant insertion process. So, starting with the incision and continuing with suturing for primary closure, a dental implant implantation technique begins and finishes with soft tissue handling.

Many phases of dental implant treatment are influenced by flap design, according to studies. The flap design and procedure affect the crestal bone resorption and blood supply to the implanted area (6). If implant surgery is thought to alter blood flow, the protection of micro circular support, which is vital for healing, becomes more important (7). The flap should be trapezoidal, with a broader part at the base to enable adequate blood flow to healing tissues and flexibility to aid in non-tension initial wound closure (8). Passive soft tissue placement inhibits retraction by reducing rips on flap borders during the suturing procedure. Properly placed vertical releasing incisions and flap reflection are the best ways to achieve this (9).

When implants are put in aesthetic zones, the flap design becomes more important. Implants put in the anterior region benefit from a thick gingival biotype with square-shaped teeth (10). When the crestal bone is resorbed or the mucoperiosteal flap is raised to place the implant, thick gingiva provides more support for the gingival margin (11). Our team has extensive knowledge and research experience that has translate into high quality publications (12–21)

This study investigates the association of flap design and wound healing after implant placement in private dental colleges and hospitals, Chennai, Tamil Nadu.

2. Materials and Methods

It is a single centred retrospective study conducted at Saveetha dental college and hospitals, Chennai. 392 patients who underwent implant placement, predominantly South Indians, were included in the study. Ethical clearance was obtained from the International review board. The study was conducted from April 2020 to March 2021. Validation of the study was done by undergraduates, postgraduates and all faculty members of Saveetha dental college.

Data collection was done by using patient management software which has all patients records. It is a recording system of all patients of all data related to patients' medical and dental history and treatment done in Saveetha dental college. The collected data were tabulated under the following parameters - name, age, gender, flap design and wound healing. The main variables include flap design and wound healing.

The data analysis was performed using SPSS software (version 23). The chi-square test and Pearson correlation were done. The chi-square test was used to compare the data and checked for the distributions at 0.05 level of significance for the effect of statistical significance.

3. Result and Discussion

According to the findings, 212 males and 182 females out of 394 patients had implants placed. Patients who had a full-thickness flap had better-wound healing results (66.58 %). Patients in all age groups had better-wound healing and less unsatisfactory wound healing. Flap design consideration had no significant difference when compared between males and females (Figure 2), but the difference was statistically significant when different age groups were compared.

Figure 1 depicts the relationship between age and wound healing, with 7.87% of patients in the 18-25 year age group having satisfactory wound healing and 1.27% having unsatisfactory wound healing. Between 26 and 35, 25.6 % of patients had adequate wound healing, while 2.28% had unsatisfactory wound healing. Between the ages of 36 and 45, 17.01% of patients had sufficient wound healing, and 5.08% had unsatisfactory wound healing. Between 46 and 55, 27.16% of wounds healed satisfactorily, while 2.54 % did not. 5.33% of patients aged 56 to 60 had satisfactory wound healing, while 4.31% of those above 60 had satisfactory wound healing, and 1.52% had unsatisfactory healing. The value of the chi-square was 0.02 and which is statistically significant.

The relationship between flap design and wound healing is depicted in Figure 3. The wound healing of 66.58% of patients with full-thickness flaps was satisfactory, while 8.93% had unsatisfactory wound

healing. With a full-thickness flap and single vertical release, 17.60% of patients had adequate wound healing, and 3.57% had poor wound healing. 3.06% of patients with full-thickness flaps with double vertical flaps saw adequate wound healing, while 0.26% experienced insufficient wound healing. The p-value was 0.04, which is statistically significant. Partial-thickness flaps can result in less bone loss than full-thickness flaps; according to a study conducted by Stefan Ficki et al., there is considerable heterogeneity (22). The adoption of partial-thickness flaps does not guarantee that all bone loss will be avoided. When compared to the elevation of full-thickness flaps, the method may result in reduced bone loss (23). Studies have shown that periosteal disruption will cause a loss of blood supply to the bone, enhancing bone resorption. A full-thickness (mucoperiosteal) flap will raise the periosteum from the bone, which can cause temporary hypoxia in the surrounding bone, resulting in bone resorption (24). In addition,

after disruption, the periosteum requires one month to reattach to the bone, which means a delayed wound in healing (25). A less invasive flap reflection technique is the partial-thickness flap, in which the periosteum is left attached to the bone, and only the mucosa is reflected (24,26). The blood supply to the bone will remain intact, and the bone cells will not suffer from hypoxia or loss of nutrition (27). Some technical difficulties are associated with partial-thickness flaps that require skill, and flap perforation is a common complication. Careful assessment is mandatory for evaluating the flap type needed for each case, mainly when crestal bone resorption significantly affects the implant success rate.

The limitations of the study include, it is a single centred study with a small population. It does not include information about the number of implants places and the type of suturing technique used. The future scope of the study consists of it can be used for further studies with a higher population.

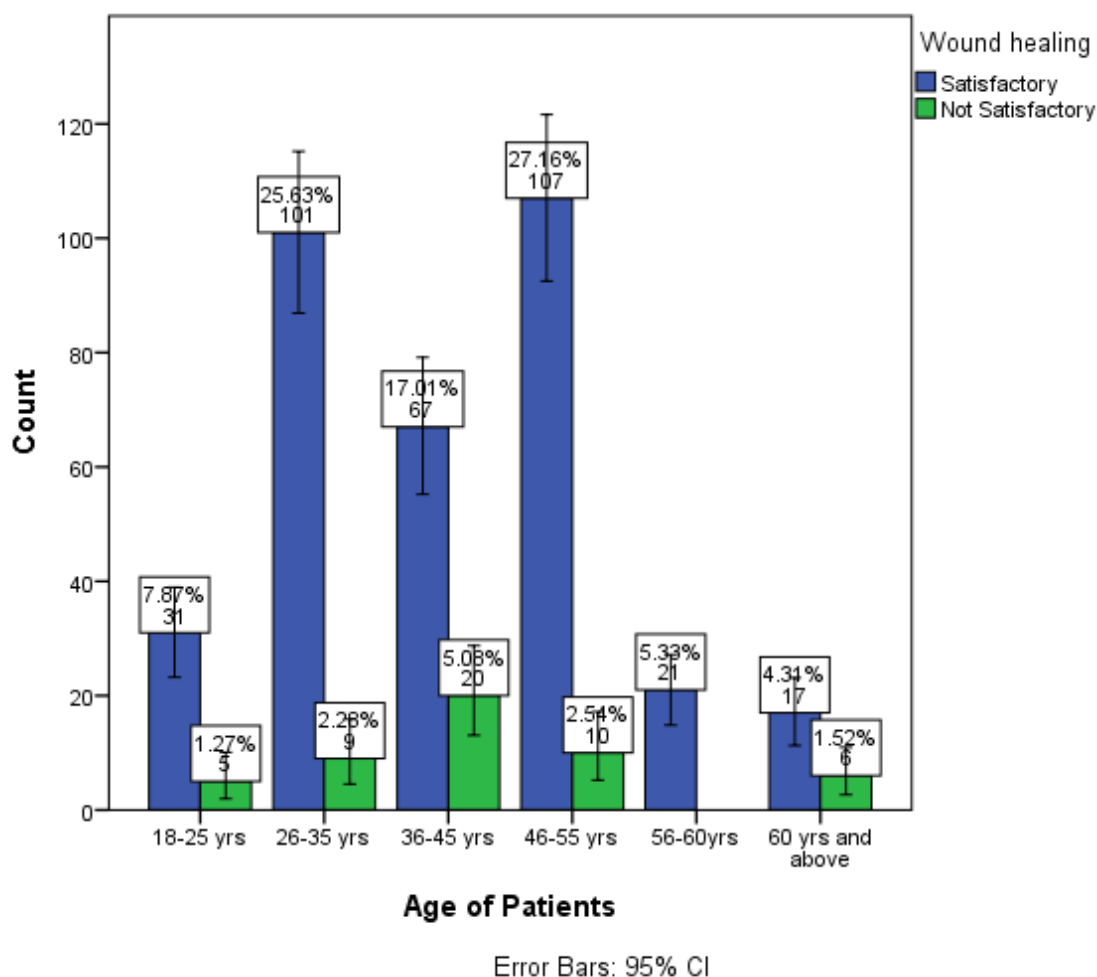


Figure 1 :- Bar graph depicting the relationship between age and type of wound healing. X-axis denotes age and y-axis denotes number of patients. Blue colour denotes satisfactory wound healing and green denotes unsatisfactory wound healing. Chi square test was done and the association was found to be statistically significant. Pearson chi square value p value : 0.02 (<0.05) hence statistically significant, hence proving that younger patients had better wound healing.

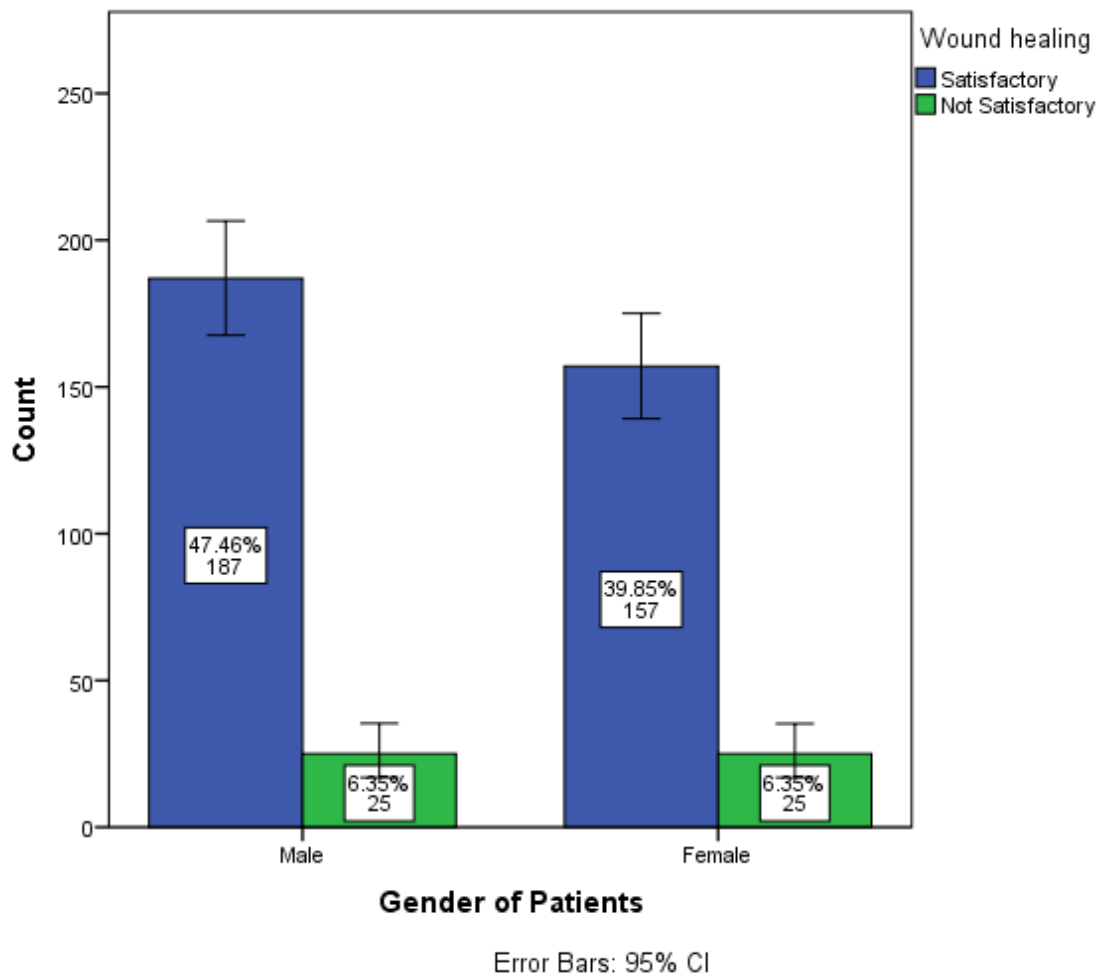


Figure 2 :- Bar graph depicting the relationship between gender and type of wound healing. X-axis denotes gender and y-axis denotes number of patients. Blue colour denotes satisfactory wound healing and green denotes unsatisfactory wound healing. Chi square test was done and the association was found to be statistically significant. Pearson chi square value p value : 0.04 (<0.05) hence statistically significant,

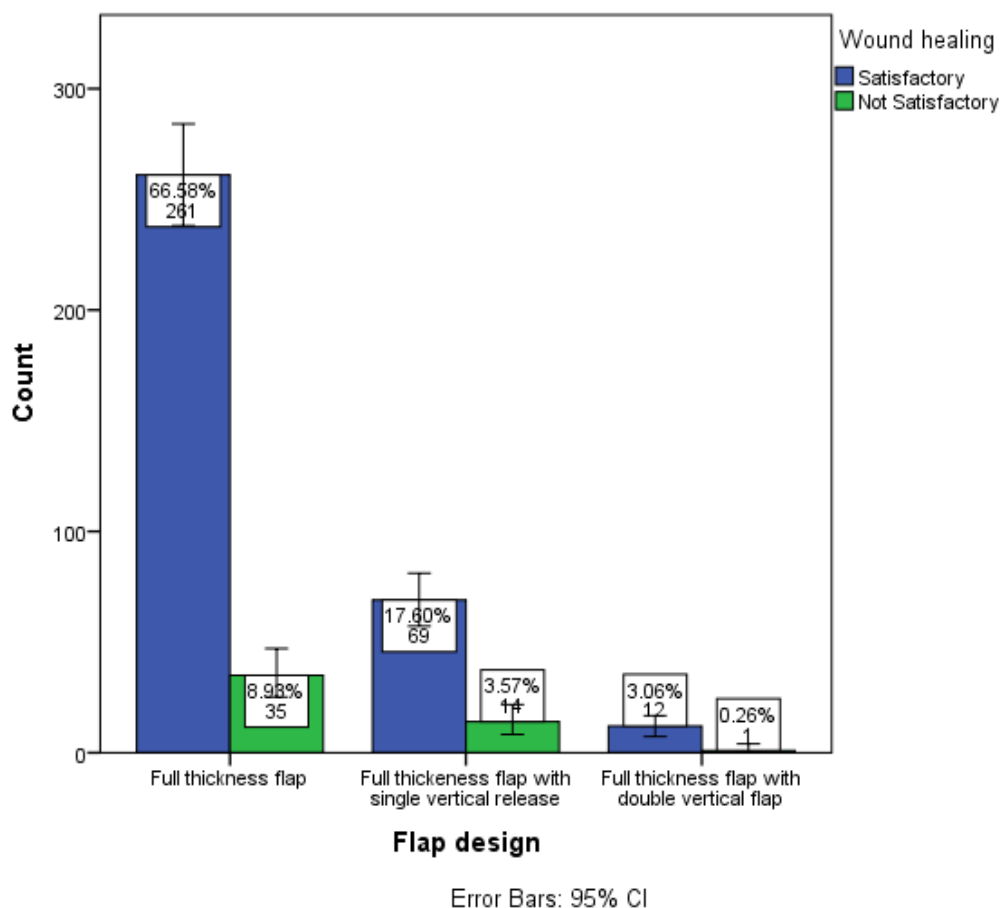


Figure 3 :- Bar graph depicting the association between flap design and type of wound healing. X-axis denotes type of flap design and y-axis denotes number of patients. Blue colour denotes satisfactory wound healing and green denotes unsatisfactory wound healing. Chi square test was done and the association was found to be statistically significant. Pearson chi square value p value : 0.04 (<0.05) hence statistically significant.

4. Conclusion

Within the study's parameters, it was concluded that patients who had a full thickness flap had better wound healing than those who had a full thickness flap with a single vertical release or a double vertical release and association was found to be statistically significant.

Acknowledgement

We would like to acknowledge Saveetha dental college and hospital for providing complete patient details required for the study purpose and their constant help and support for this research.

Conflict Of Interest

The authors declare no conflict of interest.

Source Of Funding :-

The present project is funded by Saveetha Institute of Medical and Technical Sciences Saveetha Dental college and Hospitals, Saveetha University and Rakshith homes pvt.ltd.

5. Reference

Suleiman M. The Effect of Flap Design on Wound

Healing after Periapical Surgery: A Comparative Study [Internet]. Vol. 8, Al-Rafidain Dental Journal. 2008. p. 120–7. Available from: <http://dx.doi.org/10.33899/rden.2008.9039>

Thukral H. CONCEPT OF HEALING AFTER DENTAL IMPLANT PLACEMENT [Internet]. World Journal of Pharmacy and Pharmaceutical Sciences. 2017. p. 1250–7. Available from: <http://dx.doi.org/10.20959/wjpps20178-9729>
 Odekerken JCE, Brans BT, Welting TJM, Walenkamp GHI. 18F-FDG microPET imaging differentiates between septic and aseptic wound healing after orthopedic implant placement [Internet]. Vol. 85, Acta Orthopaedica. 2014. p. 305–13. Available from: <http://dx.doi.org/10.3109/17453674.2014.900894>

Ho CCK, Attia D, Liu J. Flap Design and Management for Implant Placement [Internet]. Practical Procedures in Implant Dentistry. 2021. p. 145–54. Available from: <http://dx.doi.org/10.1002/9781119399186.ch>

15

- Proussaefs P. Use of CAD/CAM Healing Abutment Immediately After Dental Implant Placement for the Non-Esthetic Zone: A Guided Soft Tissue Healing Technique [Internet]. Vol. 42, *Journal of Oral Implantology*. 2016. p. 189–93. Available from: <http://dx.doi.org/10.1563/aaid-joi-d-14-00228>
- Garg AK. Wound Healing and Suturing Techniques in Dental Implant Surgery [Internet]. *Implant Dentistry*. 2010. p. 103–11. Available from: <http://dx.doi.org/10.1016/b978-0-323-05566-6.00009-5>
- Hartman GA. Immediate Implant Placement and Temporization in Extraction and Healing Sites [Internet]. Vol. 11, *Implant Dentistry*. 2002. p. 393–4. Available from: <http://dx.doi.org/10.1097/00008505-200211040-00049>
- Kalaivani N, Arun M, Abhinav RP, Ramakrishnan M. Requirement of Osteoplasty in Dental Implant Surgery-A Retrospective Analysis. *J Long Term Eff Med Implants*. 2020;30(2):141–5.
- Imber JC. The Recession Healing Index to assess wound healing after recession coverage [Internet]. Available from: <http://dx.doi.org/10.26226/morressier.5ac383292afeeb00097a4601>
- Larjava H. *Oral Wound Healing: Cell Biology and Clinical Management*. John Wiley & Sons; 2012. 432 p.
- Stajčić Z. *Atlas of Implant Dentistry and Tooth-Preserving Surgery: Prevention and Management of Complications*. Springer; 2017. 334 p.
- Ramesh A, Varghese S, Jayakumar ND, Malaiappan S. Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study. *J Periodontol*. 2018 Oct;89(10):1241–8.
- Vijayashree Priyadharsini J. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. *J Periodontol*. 2019 Dec;90(12):1441–8.
- Priyadharsini JV, Vijayashree Priyadharsini J, Smiline Girija AS, Paramasivam A. In silico analysis of virulence genes in an emerging dental pathogen *A. baumannii* and related species [Internet]. Vol. 94, *Archives of Oral Biology*. 2018. p. 93–8. Available from: <http://dx.doi.org/10.1016/j.archoralbio.2018.07.001>
- Teja KV, Ramesh S, Priya V. Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study. *J Conserv Dent*. 2018 Nov-Dec;21(6):592–6.
- Manohar MP, Sharma S. A survey of the knowledge, attitude, and awareness about the principal choice of intracanal medicaments among the general dental practitioners and nonendodontic specialists. *Indian J Dent Res*. 2018 Nov-Dec;29(6):716–20.
- Nandakumar M, Nasim I. Comparative evaluation of grape seed and cranberry extracts in preventing enamel erosion: An optical emission spectrometric analysis. *J Conserv Dent*. 2018 Sep-Oct;21(5):516–20.
- Varghese SS, Ramesh A, Veeraiyan DN. Blended Module-Based Teaching in Biostatistics and Research Methodology: A Retrospective Study with Postgraduate Dental Students. *J Dent Educ*. 2019 Apr;83(4):445–50.
- Panchal V, Jeevanandan G, Subramanian E. Comparison of instrumentation time and obturation quality between hand K-file, H-files, and rotary Kedo-S in root canal treatment of primary teeth: A randomized controlled trial. *J Indian Soc Pedod Prev Dent*. 2019 Jan-Mar;37(1):75–9.
- Nair M, Jeevanandan G, Vignesh R. Comparative evaluation of post-operative pain after pulpectomy with k-files, kedo-s files and mtwo files in deciduous molars-a randomized clinical trial. *Braz Dent J* [Internet]. 2018; Available from: <https://bds.ict.unesp.br/index.php/cob/article/view/1617>
- Felicita AS. Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor - The sling shot method. *Saudi Dent J*. 2018 Jul;30(3):265–9.
- Porcaro G, Busa A, Bianco E, Caccianiga G, Maddalone M. Use of a Partial-thickness Flap for Guided Bone Regeneration in the Upper Jaw. *J Contemp Dent Pract*. 2017 Dec 1;18(12):1117–21.
- Sonick M, Hwang D. *Implant Site Development*. John Wiley & Sons; 2011. 456 p.
- Nemcovsky CE, Artzi Z, Moses O, Gelernter I. Healing of marginal defects at implants placed in fresh extraction sockets or after 4-6 weeks of healing. A comparative study. *Clin Oral Implants Res*. 2002 Aug;13(4):410–9.
- Gopal TM, Rohinikumar S, Nesappan T. Association of Gingival Biotype and Soft Tissue Healing One Week after Implant Placement. *J Long Term Eff Med Implants*. 2020;30(3):213–8.
- Trombelli L, Farina R. *Flap Designs for Periodontal Healing* [Internet]. *Oral Wound Healing*. 2013. p. 229–42. Available from: <http://dx.doi.org/10.1002/9781118704509.ch9>

- Deena, S. R., Kumar, G., Vickram, A. S., Singhaniam, R. R., Dong, C. D., Rohini, K., ... & Ponnusamy, V. K. (2022). Efficiency of various biofilm carriers and microbial interactions with substrate in moving bed-biofilm reactor for wastewater treatment: A review. *Bioresource Technology*, 127421.
- Hupp JR, Tucker MR, Ellis E. *Contemporary Oral and Maxillofacial Surgery E-Book*. Elsevier Health Sciences; 2018. 721 p.