

# EFFECTIVENESS OF DIFFERENT TYPES OF BONE GRAFTS AND PRF/CGF USED BY VARIOUS DEPARTMENTS IN A UNIVERSITY HOSPITAL SETTING - A RETROSPECTIVE STUDY

Monisha.K<sup>1</sup>, Senthil Murugan.P<sup>2</sup>, Aravind Kumar<sup>3</sup>

## Abstract

*Bone grafts are used as a filler and scaffold to facilitate bone formation and promote wound healing. Grafts are usually bioresorbable and have no antigen-antibody reaction. Platelet Rich Fibrin (PRF) and Concentrated Growth Factor (CGF) are also used for surgical procedures to improve wound healing and promote tissue regeneration. At present the usage of these bone grafts and PRF/CGF has spread not only to oral and maxillofacial surgery and implantology but also in almost all the speciality dental departments like Periodontics, Prosthodontics and Endodontics. The aim of this study was to assess the type of bone grafts and PRF and CGF used in all departments of Saveetha Dental College and Hospital, Chennai. This Retrospective study was carried on one year period between June 2019 to April 2020 and on 66 patients (40 males and 26 Females) who reported to Saveetha Dental College and Hospital, Chennai. This final sample of 66 patients data were considered after analysing all the 86000 total patients records for the year 2019-2020, scrutinizing and fulfilling the inclusion and exclusion criteria. All available data was entered tabulated and entered in Excel sheets. The statistical analysis of Chi square test done through SPSS and the significance level kept at  $p < 0.05$ . In this study we observed that Xenograft 51.5 % is used in bone healing procedures and are used in the age group of 41-50 years of age. The presence of satisfactory wound healing was more prevalent in xenograft used procedures. In conclusion, xenograft is the most used and most widely used in bone grafting procedures.*

**Keywords:** Bone grafts, Bone healing, Concentrated Growth Factor (CGF), Platelet Rich Fibrin (PRF), Xenograft.

## I. Introduction

Platelet rich fibrin PRF, a self clotted preparation of platelet-concentrated, blood, derived materials, is prepared solely by contract activation of intrinsic coagulation pathway.[1] [2]. It is considered as a second generation platelet concentrate, consisting of viable platelets, releasing various growth factors such as platelet-derived growth factor, vascular endothelial growth factor, transforming growth factor, insulin-like growth factor, epidermal growth factor and basic fibroblast growth factor [3]. PRF is further modified into two types:-A PRF-an advanced type that is expected to contain greater numbers of white blood cells.[4] [5] and concentrated growth factor CGF, prepared under facilitated Intrinsic coagulation cascade.[6]

---

<sup>1</sup> Saveetha dental College and Hospitals, Saveetha Institute of medical and technical sciences, (SIMATS), Saveetha university, Chennai 77, India, [151501081.sdc@saveetha.com](mailto:151501081.sdc@saveetha.com)

<sup>2</sup> Corresponding Author: Reader, Department of Oral and maxillofacial surgery, Saveetha dental College and Hospitals, Saveetha Institute of medical and technical sciences, (SIMATS), Saveetha university, Chennai -77, Tamilnadu, India, [senthilmuruganp.sdc@saveetha.com](mailto:senthilmuruganp.sdc@saveetha.com)

<sup>3</sup> Professor and Head; Vice principal, Department of Orthodontics, Saveetha dental College and Hospitals, Saveetha Institute of medical and technical sciences, (SIMATS), Saveetha university, Chennai 77, India, [aravinkumar@saveetha.com](mailto:aravinkumar@saveetha.com)

The insufficient quantity of bone is due to tooth loss which results in rapid resorption of alveolar bone due to lack of interest or stimulation by periodontal ligament (PDL) fibres. Tissue scarring is found less in surgical approaches [7]

In oral submucous fibrosis surgical treatment modalities have evolved but the mainstay is release of fibrosis by excision of fibrous bands with or without grafts. Reconstruction of the defect after incision and release of fibrous bands is done with variety of options such as skin grafts [8]

Bone grafting is a surgical procedure that replaces missing bone with material from the patient's own body, an artificial, synthetic or natural substitute. To date, many different materials can be found to fill bone defects. These can be allogenic bone, bone substitutes.

Xenogenic bone grafts are defined as synthetic, inorganic or biologically organic combinations which can be used for the treatment of bony defects in orofacial regions as an alternative to autologous or allogeneic bone grafts. [9] [10]. From the recently published literature of our centre, it is clear that the role of Botox injections as a therapeutic agent keeps increasing its application in various orofacial conditions. [11].

Bone grafting is possible because bone tissue has the ability to regenerate completely if provided the space into which it has to grow. Bone grafts and other adjuncts like PRF and CGF is used in application of dental implants, in order to restore edentulous area of a missing tooth. In general, bone grafts are either used in block or as a particulate material, to adapt it better to the defect [12]. Besides the main use of bone grafting and dental implants, the procedure is used to fuse joints to prevent movement, Repair broken bones that have bone loss, repair a broken bone that has not yet healed. [13]

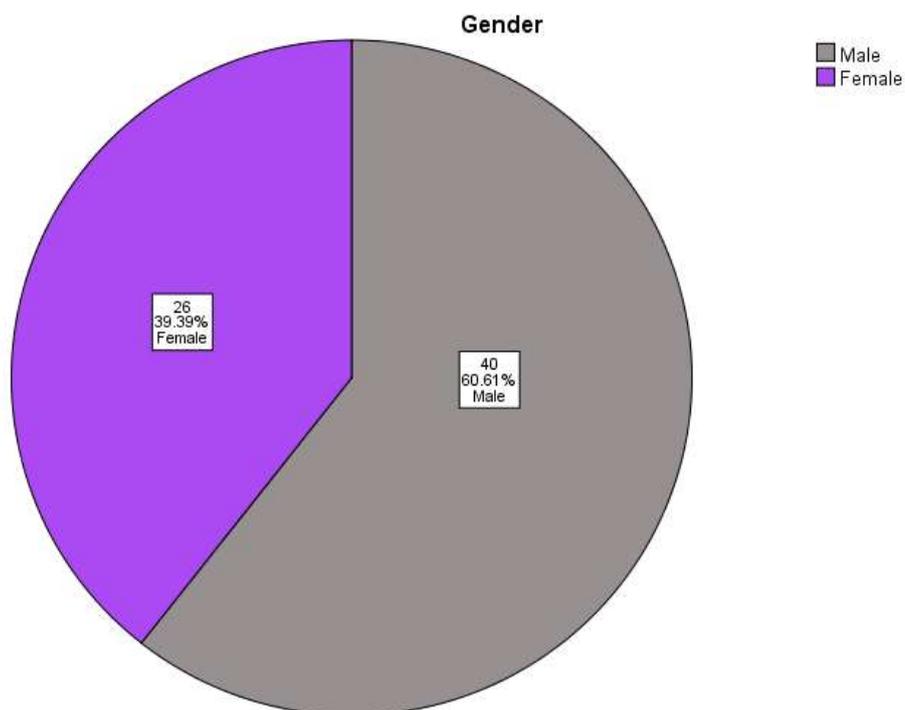
The aim of this study is to assess the efficiency of different types of bone grafts, PRF, CGF which are commonly used in different clinical departments of Saveetha Dental College and also to assess which type provides or promotes better wound healing.

## II. MATERIALS AND METHODS

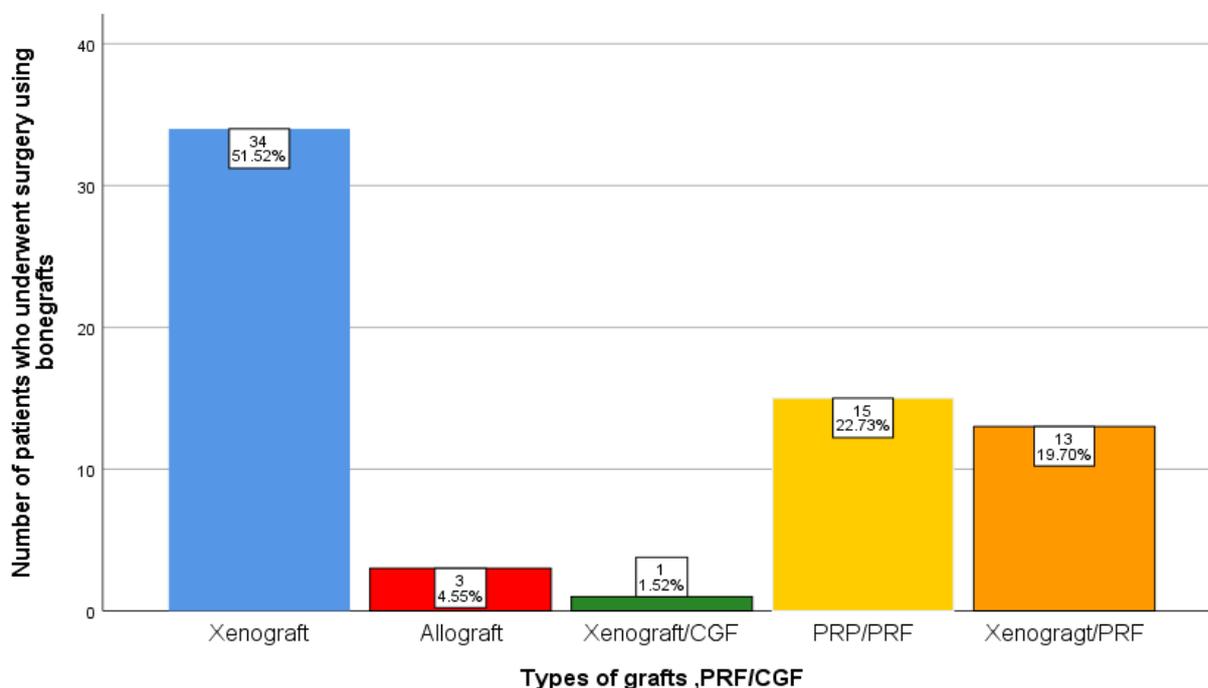
This is a retrospective study conducted on 76 patients (40 males, 36 females) who reported to Saveetha Dental College, Chennai from June 2019 to April 2020. Ethical clearance for the retrospective study was obtained from Saveetha research based SRB Saveetha Dental College and Hospitals. Ethical approval number SDC/SIHEC/2020/DIASDATA/0619-0320. The patients who had undergone bone grafting procedure using bone grafts and PRF/CGF in different clinical dental departments were chosen as study population. Data collected from 86000 patients case sheets which were reviewed and analysed for treatment with bone grafting procedures and final sample of 76 patients were enrolled in their study after fulfilling inclusion and exclusion criteria. Cross verification was done using photographs and contact number to avoid bias. All the data were entered into Microsoft Excel Document. Descriptive statistics was used to evaluate age, gender and bone grafts, PRF/CGF. Independent variables are age and gender. Dependent variables are bone grafts, PRF/CGF, wound healing. Statistical test was done using the Chi-Square test from IBM by statistical software. SPSS software version 19 was used and statistical significance level kept at  $p < 0.05$ .

## III. RESULTS

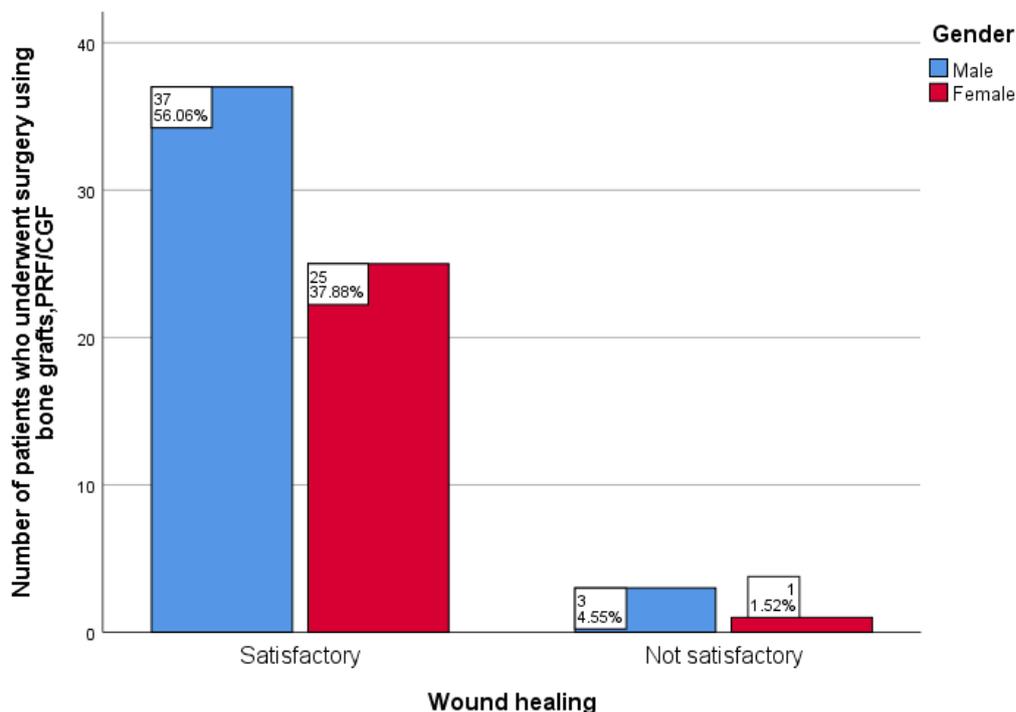
From the results, 76 patients (40 males, 36 females) are reported to have undergone surgical procedures with bone graft, PRF and CGF is shown in Figure 1.



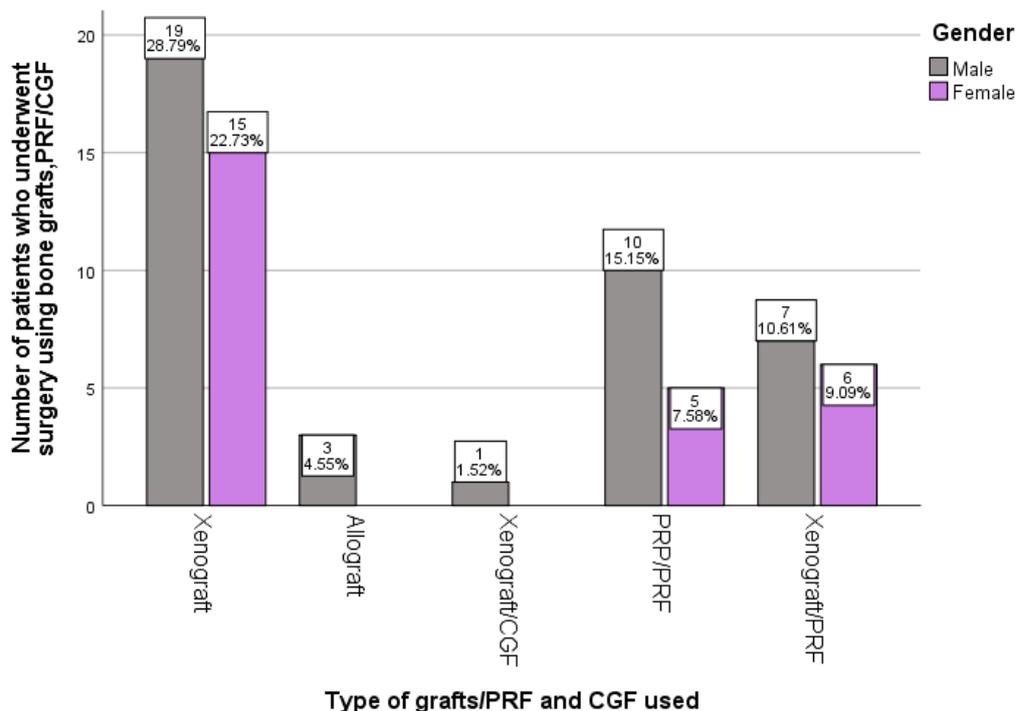
**Figure-1:** Pie-chart represents distribution of study population who used bone grafts, PRF and CGF. Grey depicts males and purple depicts females. From the pie-chart we can infer that there exists more male prevalence (60.61%) when compared to females (39.39%) in this study.



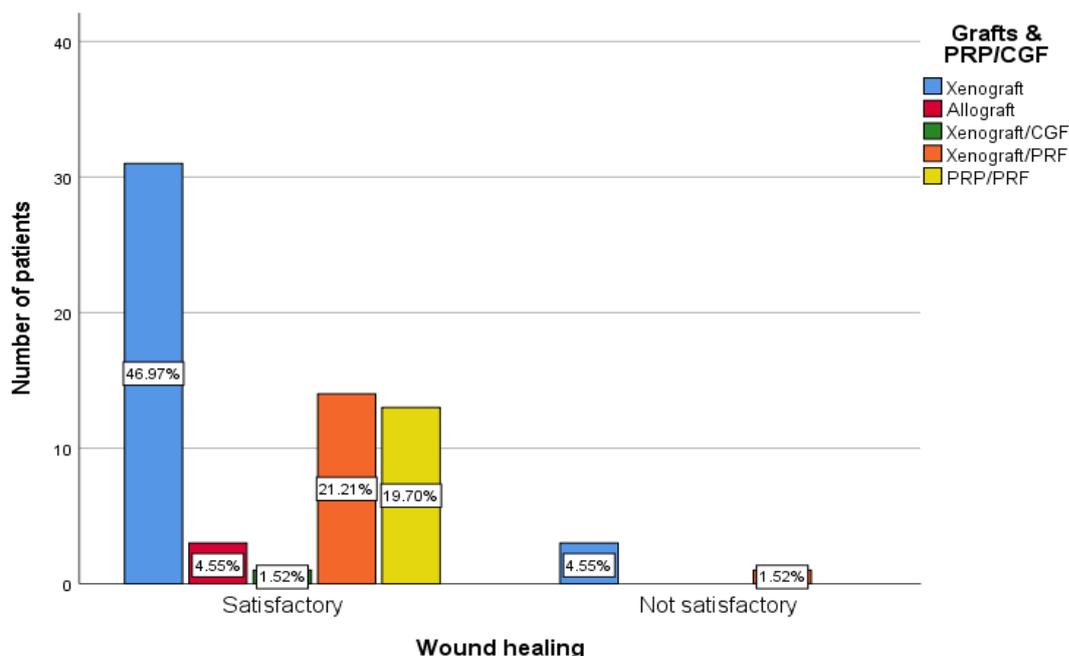
**Figure-2:** Bar graph represents the distribution of different types of grafts. The x-axis denotes the different types of bone grafts and y-axis denotes number of patients in each type of graft. From the graph, it is observed that the prevalence of using Xenograft (34%) in bone grafting procedures is more when compared to other types of grafts.



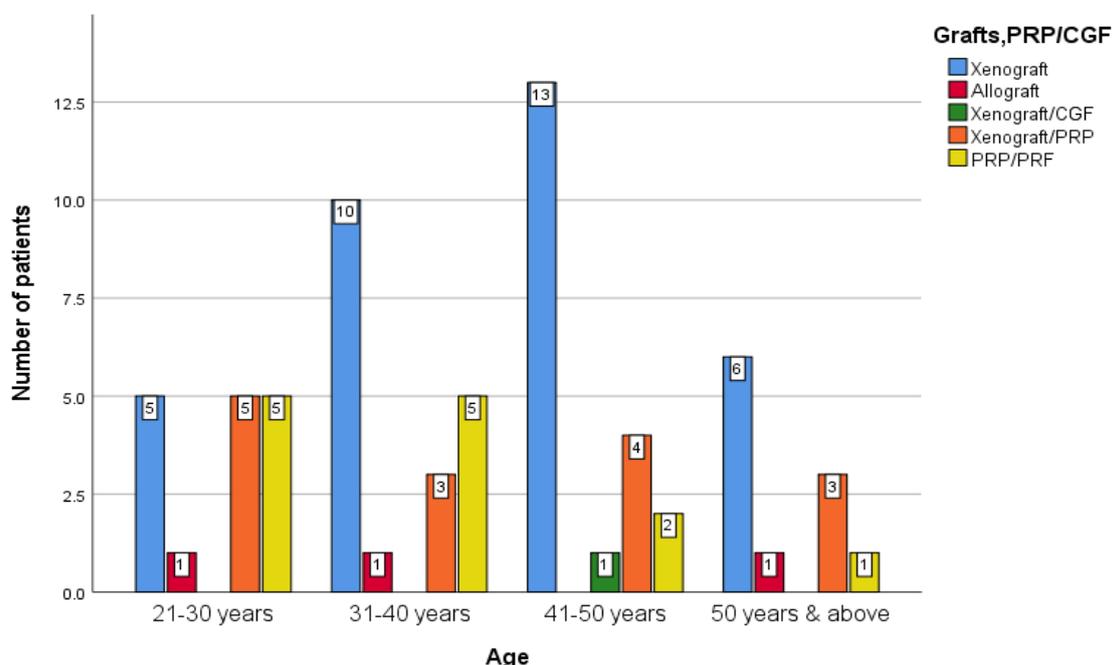
**Figure-3:** Bar graph represents association of wound healing between gender and type of bone grafts. The x-axis denotes age group of the patients and y-axis denotes number of patients in each type of graft. From the graph it is observed that males are having better wound healing potential when compared to females.



**Figure-4:** Bar graph represents association of wound healing between gender and type of bone grafts. The x-axis denotes age group of the patients and y-axis denotes number of patients in each type of graft. Chi Square test was done and the association was found to not significant statistically. Pearson's Chi square p value -1.818 ( $p > 0.05$ ) hence statistically not significant. Even though the finding is not statistically significant, better wound healing is more prevalent in males among all types of bone grafts.



**Figure-5:** Bar graph represents association of wound healing of patients and types bone grafts. The x-axis indicates satisfactory and not satisfactory wound healing in different types of grafts and y-axis denotes number of patients in each age group. Chi Square test was done and the association was found to not significant statistically. Pearson's Chi square p value -1.838 ( $p > 0.05$ ) hence statistically not significant. Even though the finding is not statistically significant, it is observed that wound healing was better when Xenografts were used for bone grafting.



**Figure-6:** Bar graph represents association of wound healing between age group and type of bone grafts. The x-axis denotes age group of the patients and y-axis denotes number of patients in each type of graft. Chi Square test was done and the association was found to not significant statistically. Pearson's Chi square p value -1.818 ( $p > 0.05$ ) hence statistically not significant. Even though the finding is not statistically significant, role of Xenograft in wound healing is more prevalent among 41-50 years age group.

The distribution of different types of bone grafts among the study population is shown in Figure-2. It is observed from this study that the usage of Xenograft (34%) in bone grafting procedures is more when compared to other forms of graft materials.

Gender distribution in wound healing and type of bone grafts, PRF and CGF used is shown in Figure-4. The graph shows that better wound healing is present among males compared to females amongst all types of bone grafts, PRF and CGF used.

The association of gender distribution among different types of bone grafts is shown in Figure-4. Males were predominant than females in all types of bone grafts, PRF and CGF used.

Association of type of grafts, PRF and CGF used with age wise distribution is shown in Figure-5

30% Xenograft used was highest in the age group 41 to 50 years, 1.5% Allograft was predominantly used in patients with 20-30, 31-40 and 50 years of age group and 1.5% Xenograft /CGF was mostly used in 41-50 years of age, 7.5% Xenograft and PRF was used mostly used in 20 to 30 years of age. 1% PRF /PRP were used in 20 to 30 years and 31-40 years of age

Association of type of graft used with wound healing is shown in Figure-6

Satisfactory wound healing was better in Xenograft 46.7% used bone grafting procedures and 4.55% of satisfactory healing observed in allograft, 1.52% in xenograft/CGF, 21.2% in Xenograft/PRP, 19.7% in PRP/PRF whereas healing was not satisfactory in xenograft with 4.55% individuals and in 1.52% of patients with xenograft/PRP.

#### IV. DISCUSSION

Fibrin clot membranes prepared from advanced platelet-rich Fibrin (A-PRF) or concentrated growth factors (CGF) despite their relatively rapid biodegradability, have been used as bio active barrier membrane for alveolar bone tissue regeneration. In a study done by Opden Allografts elicited highest refusal rate of 41% patients, that they would never accept this type of bone graft [14]. In the current study, allograft material used for 4.5% patients. Allograft are commonly available worldwide [15]

Most patients should be aware about the type of bone grafts used and should be informed about the risk of infections following bone grafting procedures. Allografts from living donors are primarily obtained from the femoral head of patients undergoing hip replacement surgery.

In the current study, Xenografts as bone grafting procedure in 51.5%. 18% patients have undergone surgical procedure using xenograft. There is 15% of rejection in patients with Xenograft at any circumstance. The reason is because of disease transmission. No studies showed significant age-group preference of Xenograft. However, in this study, the age group 41-50 years showed the highest prevalence of Xenograft with 13 patients.

Wound healing is high in Xenograft procedure compared to other bone graft substitutes and platelets influence macrophages which arise by means of vascular ingrowth into the operated site. This process is stimulated by platelets, assuming responsibility for wound healing regulation by secreting their own growth factor. Thus the platelets at the repair site ultimately set the place for wound repair. [16].

Better wound healing found in the control group than in the alveolar osteitis group and the same is reported in other studies and also less pain, inflammation, infection found in control group [17]. The natural healing in any wound starts as blood coagulation leading to fibrin/platelet clot and Matrix. Use of Tranexamic acid was the best protocol in reducing blood loss during major oral and maxillofacial surgical procedures. It helps in minimizing the operating time, and providing the best surgical field. [18]. Dentists should be aware of how to reduce anxiety before treatment to reduce pain during the treatment.

Pharmacologic modalities like sedation can be used for reducing anxiety [19][20]. Combined with opioid analgesics, paracetamol can also be used in the management of severe pain in postoperative period [21].

### **Limitations and future scope of the study:**

Being a short term study with less sample size, the findings of this study has to be ascertained with further studies. so further studies are required to study the type of bone and platelet substitutes in each field of dentistry in a prospective study. [22] [23] [22].

Hence, these findings imply that proper training, continuing education programs, and short-term courses about BMW management, and infection control procedures are required to motivate the dental students and dental auxiliaries. [24], [25]

## **V. CONCLUSION**

This study concludes that Xenograft is the most widely used bone substitute in the present study; it also promotes faster bone healing and tissue regeneration than the other substitutes studied in this study. However it also depends on surgeons preference and their perception should be studied to evaluate and further studies. To ascertain the findings regarding which type of bone graft suits for particular bony defect, a Randomized controlled trial with long duration and larger population has to be done .

### **AUTHORS CONTRIBUTIONS**

First author [Monisha.K.] performed the analysis, and interpretation and wrote the manuscript.

Second author [Dr.Senthil Murugan.P] contributed to conception, study design, data design, analysis, interpretation and critically revised the manuscript.

Third author [Dr.Aravind Kumar S] participated in the study and revised the manuscript.

All the three authors have discussed the results and contributed to the final manuscript.

### **ACKNOWLEDGEMENT**

This research was supported by Saveetha Dental College and Hospitals. We thank the department of Oral and Maxillofacial surgery, Cleft and Craniofacial Centre, Saveetha Dental College for providing insight and expertise that greatly assisted the research.

### **CONFLICT OF INTEREST**

The authors declare that there is no conflict of interests.

## **REFERENCES**

- [1]. Choukroun J, Diss A, Simonpieri A, Girard M-O, Schoeffler C, Dohan SL, et al. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part V: Histologic evaluations of PRF effects on bone allograft maturation in sinus lift [Internet]. Vol. 101, Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2006. p. 299–303. Available from: <http://dx.doi.org/10.1016/j.tripleo.2005.07.012>
- [2.] Kawase T. Platelet-rich plasma and its derivatives as promising bioactive materials for regenerative medicine: basic principles and concepts underlying recent advances. *Odontology*. 2015 May;103(2):126–35.
- [3]. Panda S, Jayakumar ND, Sankari M, Varghese SS, Kumar DS. Platelet rich fibrin and xenograft in treatment of intrabony defect. *Contemp Clin Dent*. 2014 Oct;5(4):550–4.

- [4]. Mallhi RS, Kumar S, Philip J. A Comparative Assessment of Quality of Platelet Concentrates Prepared by Buffy Coat Poor Platelet Concentrate Method and Apheresis Derived Platelet Concentrate Method [Internet]. Vol. 31, Indian Journal of Hematology and Blood Transfusion. 2015. p. 453–9. Available from: <http://dx.doi.org/10.1007/s12288-014-0476-z>
- [5]. Marimuthu M, Andiappan M, Wahab A, Muthusekhar MR, Balakrishnan A, Shanmugam S. Canonical Wnt pathway gene expression and their clinical correlation in oral squamous cell carcinoma [Internet]. Vol. 29, Indian Journal of Dental Research. 2018. p. 291. Available from: [http://dx.doi.org/10.4103/ijdr.ijdr\\_375\\_17](http://dx.doi.org/10.4103/ijdr.ijdr_375_17)
- [6]. Garrino L, editor. Strumenti per una medicina del nostro tempo: Medicina narrativa, Metodologia Pedagogia dei Genitori e International Classification of Functioning (ICF). Florence: Firenze University Press; 2015. (Strumenti per la didattica e la ricerca; vol. 169).
- [7]. Packiri s. management of paediatric oral ranula: a systematic review [internet]. journal of clinical and diagnostic research. 2017. available from: <http://dx.doi.org/10.7860/jcdr/2017/28498.10622>
- [8]. Patil SB, Durairaj D, Suresh Kumar G, Karthikeyan D, Pradeep D. Comparison of Extended Nasolabial Flap Versus Buccal Fat Pad Graft in the Surgical Management of Oral Submucous Fibrosis: A Prospective Pilot Study [Internet]. Vol. 16, Journal of Maxillofacial and Oral Surgery. 2017. p. 312–21. Available from: <http://dx.doi.org/10.1007/s12663-016-0975-6>
- [9]. Schlickewei W, Schlickewei C. The use of bone substitutes in the treatment of bone defects--the clinical view and history. In: Macromolecular Symposia. Wiley Online Library; 2007. p. 10–23.
- [10]. Pryor LS, Gage E, Langevin C-J, Herrera F, Breithaupt AD, Gordon CR, et al. Review of bone substitutes. Craniomaxillofac Trauma Reconstr. 2009 Oct;2(3):151–60.
- [11]. Kumar S. the emerging role of botulinum toxin in the treatment of orofacial disorders: literature update [Internet]. Vol. 10, Asian Journal of Pharmaceutical and Clinical Research. 2017. p. 21. Available from: <http://dx.doi.org/10.22159/ajpcr.2017.v10i9.16914>
- [12]. Jain SV, Vijayakumar Jain S, Muthusekhar MR, Baig MF, Senthilnathan P, Loganathan S, et al. Evaluation of Three-Dimensional Changes in Pharyngeal Airway Following Isolated Lefort One Osteotomy for the Correction of Vertical Maxillary Excess: A Prospective Study [Internet]. Vol. 18, Journal of Maxillofacial and Oral Surgery. 2019. p. 139–46. Available from: <http://dx.doi.org/10.1007/s12663-018-1113-4>
- [13]. Bansal S, Chauhan V, Sharma S, Maheshwari R, Juyal A, Raghuvanshi S. Evaluation of hydroxyapatite and beta-tricalcium phosphate mixed with bone marrow aspirate as a bone graft substitute for posterolateral spinal fusion. Indian J Orthop. 2009 Jul;43(3):234–9.
- [14]. Dries S op den, den Dries S op, Annema C, van den Berg AP, Ranchor AV, Porte RJ. Shared decision making in transplantation: How patients see their role in the decision process of accepting a donor liver [Internet]. Vol. 20, Liver Transplantation. 2014. p. 1072–80. Available from: <http://dx.doi.org/10.1002/lt.23921>
- [15]. Oryan A, Alidadi S, Moshiri A, Maffulli N. Bone regenerative medicine: classic options, novel strategies, and future directions. J Orthop Surg Res. 2014 Mar 17;9(1):18.
- [16]. Agrawal AA. Evolution, current status and advances in application of platelet concentrate in periodontics and implantology. World J Clin Cases. 2017 May 16;5(5):159–71.
- [17]. Jesudasan JS, Wahab PUA, Sekhar MRM. Effectiveness of 0.2% chlorhexidine gel and a eugenol-based paste on postoperative alveolar osteitis in patients having third molars extracted: a randomised controlled clinical trial. Br J Oral Maxillofac Surg. 2015 Nov 1;53(9):826–30.
- [18]. Christabel A, Anantanarayanan P, Subash P, Soh CL, Ramanathan M, Muthusekhar MR, et al. Comparison of pterygomaxillary dysjunction with tuberosity separation in isolated Le Fort I osteotomies:

- a prospective, multi-centre, triple-blind, randomized controlled trial [Internet]. Vol. 45, International Journal of Oral and Maxillofacial Surgery. 2016. p. 180–5. Available from: <http://dx.doi.org/10.1016/j.ijom.2015.07.021>
- [19]. Mp SK. Relationship between dental anxiety and pain experience during dental extractions. *Asian J Pharm Clin Res.* 2017;10(3):458–61.
- [20]. Abhinav RP, Selvarasu K, Maheswari GU, Taltia AA. The Patterns and Etiology of Maxillofacial Trauma in South India. *Ann Maxillofac Surg.* 2019 Jan;9(1):114–7.
- [21]. Rao TD, Kumar MP. Analgesic Efficacy of Paracetamol Vs Ketorolac after Dental Extractions. *Research Journal of Pharmacy and Technology.* 2018;11(8):3375–9.
- [22]. Kumar S, Sneha S. knowledge and awareness regarding antibiotic prophylaxis for infective endocarditis among undergraduate dental students [Internet]. *Asian Journal of Pharmaceutical and Clinical Research.* 2016. p. 154. Available from: <http://dx.doi.org/10.22159/ajpcr.2016.v9s2.13405>
- [23]. Kumar S. knowledge, attitude and awareness of dental undergraduate students regarding hiv/aids patients [Internet]. Vol. 10, *Asian Journal of Pharmaceutical and Clinical Research.* 2017. p. 175. Available from: <http://dx.doi.org/10.22159/ajpcr.2017.v10i5.17277>
- [24]. Mp SK, Rahman R. Knowledge, awareness, and practices regarding biomedical waste management among undergraduate dental students. *Asian J Pharm Clin Res.* 2017;10(8):341–5.
- [25]. Patturaja K, Pradeep D. Awareness of Basic Dental Procedure among General Population [Internet]. Vol. 9, *Research Journal of Pharmacy and Technology.* 2016. p. 1349. Available from: <http://dx.doi.org/10.5958/0974-360x.2016.00258.4>
- [26] Farhat Yaasmeen Sadique Basha, Rajeshkumar S, Lakshmi T, Anti-inflammatory activity of *Myristica fragrans* extract . *Int. J. Res. Pharm. Sci.,* 2019 ;10(4), 3118-3120 DOI: <https://doi.org/10.26452/ijrps.v10i4.1607>