

# Extraction Socket Seal Technique for Socket Preservation after Tooth Extraction: An Innovative Approach.

Abduljaleel Samad<sup>(1)</sup>, Jodal Ahmed<sup>(1)</sup>, Hundren M. Ali<sup>(1)</sup>, Omed Shihab<sup>(1)</sup>, Ahmed Haider<sup>(1)</sup>, Dainius Karpavicius<sup>(2)</sup>

**Background and objectives:** Tooth extraction triggers the loss of surrounding alveolar soft tissue and bone. Numerous socket preservation techniques have been used by clinical surgeons; the issue with all existing techniques is the loss of soft tissue anatomy, resulting in a flat soft tissue architecture. Our study introduces an innovative ridge preservation technique that addresses this problem; it involved using an anatomically shaped composite resin lid that acts as a graft sealant and an approach for maintaining the soft tissue cervical profile.

**Material and Methods:** The Extraction Socket Seal (ESS) technique was applied for 23 patients for socket preservation; atraumatic extraction of hopeless tooth was performed. The extraction socket was filled up with bone grafting material. After that, the composite resin lid, which was fabricated by the Cervico system was placed into the extraction socket. Finally, the lid was connected to the adjacent teeth with an adhesive system and composite resin material. The patients were evaluated for a three-month interval for any complications and success of Extraction Socket Seal (ESS) technique. The data were tested by descriptive data analysis using the Statistical Package for Social Sciences (SPSS, version 29).

**Results:** The proposed technique has been successfully performed in twenty-three cases; 13 cases were male and 10 cases were female; and the mean age of all cases was 32 years. Extraction Socket Seal (ESS) technique utilizing a composite resin lid fabricated from the Cervico system was used as socket sealant placed directly to cover the bone graft, and we found that it provided an excellent “barrier” for the graft without any unwanted complications. After three months, radiographs showed good bone healing, and the mean socket soft tissue healing score was 4 (Very good wound healing), and most importantly the soft tissue architecture and shape were well preserved.

**Conclusions:** We concluded that the Extraction Socket Seal (ESS) technique offers a very simple and time-saving technique for alveolar ridge preservation after tooth extraction for both anterior and posterior extraction sockets, and it provides a good seal for the graft material and the soft tissue anatomy was well preserved.

---

(1) Department of Oral and Maxillofacial Surgery , College of Dentistry, Hawler Medical University, Erbil, Iraq.

(2) Department of Prosthetic Treatment and Implantology of Maxillofacial Clinic, Lithuanian University of Health Sciences, Kaunas, Lithuania.

Corresponding author: Abduljaleel Samad

Email: abduljaleel. Azad@hmu.edu.krd

## INTRODUCTION

The alveolar processes and shape depend on tooth so it undergoes dramatic structural changes after teeth extraction.<sup>1</sup> The management and preservation of extraction sockets might pose a challenge for practitioners in their daily surgical practice.<sup>2</sup> It is widely accepted that the highest rate of

bone resorption typically occurs within the initial 2 to 3 months following tooth extraction; however, alveolar dimensional changes may continue for up to 1 year afterward, resulting in nearly 50% reduction of the buccolingual dimension of the ridge of the alveolus,<sup>3</sup> the resorption is primarily and most

commonly attributed to the plate of the labial bone.<sup>4</sup>

The success of implant treatment can only be considered when both aesthetic and functional goals have been guaranteed; thus, having an adequate alveolar bone crest and bone volume are crucial for obtaining rehabilitation by dental implants, satisfying both aesthetic and functional requirements.<sup>5</sup> For this reason, socket preservation procedures have been followed and implemented to maintain the volume of the bone and soft tissues after tooth extractions. The socket preservation procedures after tooth extraction are essential as they enable the placement of an implant fixture of larger diameter and length, compared to the post-extraction sockets that have not been preserved.<sup>6</sup> Additionally, they diminish the necessity for bone reconstruction and complex bone grafting techniques at the time of implant placement.<sup>6</sup>

Many different techniques of alveolar ridge preservation procedures have been suggested with the aim of preserving hard and soft tissue dimensions after tooth extraction, which is generally important in cases of anterior aesthetic and posterior implant placement, where optimal bone and soft tissue availability are essential for achieving a successful treatment outcome.<sup>7</sup> The most prevalent alveolar ridge preservation techniques typically consist of bone graft placement into the alveolar socket immediately after atraumatic tooth extraction, and nearly the majority of ridge preservation techniques focus primarily on the preservation of hard tissue only; For this reason, we propose and evaluate a new and novel ridge preservation technique named Extraction Socket Seal (ESS) which focuses on the preservation of both hard tissue dimensions and soft tissue cervical profile anatomy following tooth extraction with a simple approach by using the Cervico System.

## **METHODS**

### **Patient Selection:**

A clinical study was conducted on twenty-three patients who indicated for tooth extraction from January 2022 to October 2023; a total of 23 tooth extractions were done for twenty-three patients. Patients

were included if: they were 18 years of age or older; indicated for single tooth extraction in any part of the mouth; anterior region (central and lateral incisors and canines), premolar region (1st and 2nd premolars), and molar region (1st and 2nd molars). Patients who're pregnant or in lactation, have bleeding disorders, use steroid or anticoagulant drugs, have immune proliferative or autoimmune disorders, smoking habit, having poor oral hygiene and motivation, have acute inflammation, and patients who were unlikely to maintain appointment schedule were excluded from the study. Patients had hopeless tooth and the reasons for the extraction of teeth included in the study were periodontal disease, severe decay, root fracture, endodontic complications, or trauma. And when the situations were contraindicated for immediate implant placement, instead of immediate implant placement, socket preservation was followed with a novel approach.

Ethical approval was obtained by the Ethical Committee of the College of Dentistry, Hawler Medical University, Erbil, Iraq. The research adhered to globally recognized standards for the protection of human research participants, aligning with key international guidelines such as the Declaration of Helsinki. Prior to the commencement of the study, explicit informed consent was obtained from each participating patient.

### **Surgical procedure and fabrication of Socket Seal:**

**Step 1: Clinical and Radiographic Evaluation:**

After a thorough clinical examination, a preoperative radiographic evaluation with an orthopantomogram (OPG) and periapical view were done for all twenty-three patients Figures 1 and 2.



Figure 1: Clinical picture of palatal cusp fracture of hopeless upper 1<sup>st</sup> molar with peri-apical radiograph.



Figure 2: OPG of the patient; upper left 1<sup>st</sup> molar was painful as the palatal cusp was fractured and decided for tooth extraction.

Step 2: A flapless, “atraumatic” extraction of the hopeless tooth was performed for all the cases (Figure 3). This step was done either by extracting the whole tooth using extraction forceps or by carefully sectioning the tooth with dental carbide surgical burs into multiple pieces for cases with divergent roots in premolars and molars, and extracting the roots using fine extraction elevators.

Step 3: In the third step, the socket's soft tissue cervical profile size and shape are assessed using appropriate tools from (Cervico Guide) from (VP Innovato Holdings Ltd., Lemessos, Cyprus). Subsequently, the proper size and shape of the

composite resin lid are selected Figure 4.

Step 4: This Includes the fabrication of the composite resin lid using the mold of Cervico system (VP Innovato Holdings Ltd., Lemessos, Cyprus), utilizing a nano-hybrid flowable composite resin material, polishing brushes, and paste. We named the composite resin lid the Extraction Socket Seal (ESS) as it acts as a lid that plugs the extraction socket and seals it. The Cervico system is primarily designed for the fabrication of customized healing abutments for dental implants of any dental implant system; and for gaining a nice emergence profile around implants Figure 5. But we use it in a different way and for another purpose in our research.



Figure 3: Atraumatic Extraction of the tooth.

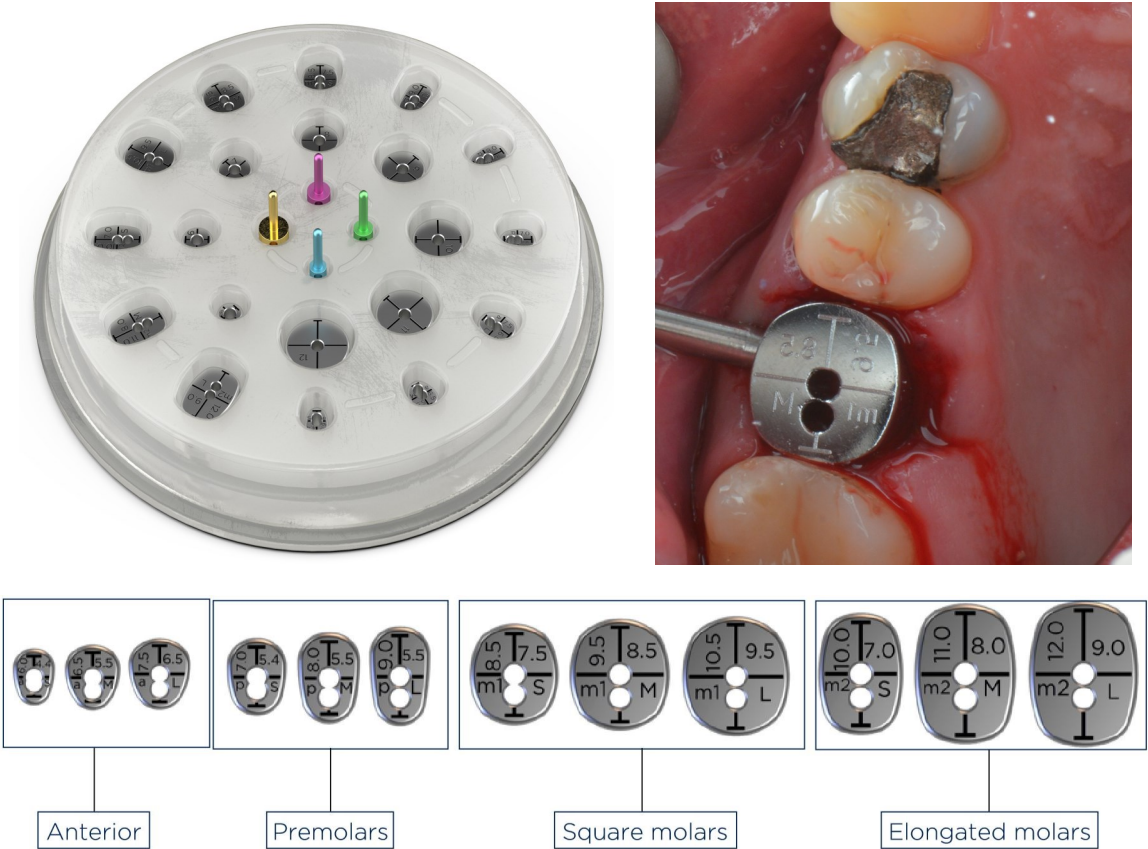
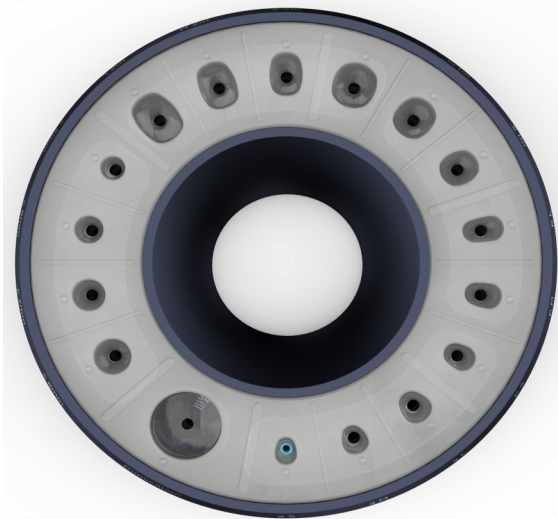


Figure 4: Evaluation of the soft tissue cervical profile of the extraction socket with the appropriate tool (Cervico Guide).



**Figure 5: Cervico mold used for fabrication of composite lid; Extraction Socket Seal (ESS).**

Step 5: This step involves the cleaning of the extraction socket thoroughly by using curettage, followed by vigorous irrigation with a sterile saline solution.

Step 6: The extraction socket was filled with bone graft material (Figure 6). It's essential that the bone graft be placed in a way that ensures it extends up to 1mm away from the cervical soft tissue margin.

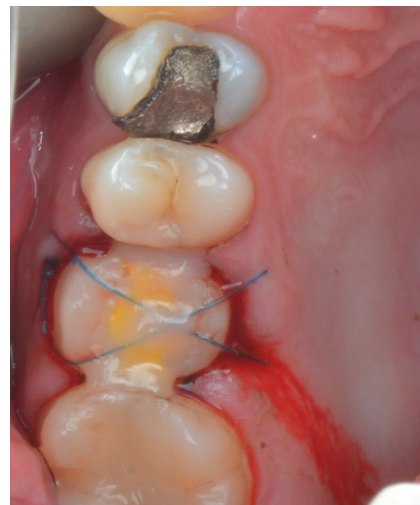


**Figure 6: Filling up the socket with bone grafting.**

Step 7: After careful isolation, the Uni-Bond self-etching bonding system was applied to the proximal surfaces of the adjacent teeth of the extraction socket, and a light cure was applied according to the protocol for using Uni-Bond as an adhesive system for direct bonding of composites to the tooth surface. Using

Uni-Bond is essential as it is very hydrophilic, avoids using acid etching gel and provides exceptional performance and bond strength.<sup>8</sup>

Step 8: This step consists of the placement of the composite resin lid (Extraction Socket Seal ESS) into the socket in alignment with its pre-extraction orientation; the lid should extend at least 1mm deep into the socket and protrude at least 2 mm above the soft tissue margins, and without interfering with the occlusion. A Uni-Bond self-etching bonding agent is then applied to the occlusal surface of the lid and again to the proximal surfaces of the adjacent teeth to the extraction socket and light cured. Finally, the lid is connected to the adjacent teeth with a light curable composite resin material. It is very important to reinforce the composite resin lid fixation with a fiber-reinforced system, or any suitable fiber reinforced tape, or orthodontic retainer wire Figure 7.



**Figure 7: Placement of the composite resin lid (Extraction Socket Seal ESS) into the socket and fixing it with flowable composite with adjacent tooth.**

Step 9: Occlusion evaluation is the last step of Extraction Socket Seal (ESS) technique; to be sure that the composite lid is out of occlusion and that the composite resin material does not interfere with the occlusion of the opposite dentition of the patient.

### Follow-up and Evaluation of socket Healing :

After a three months interval clinical success and complications of Extraction Socket Seal (ESS) technique for socket preservation were assessed and the wound

healing of the socket was evaluated after removal of the composite lid using the healing index by Landry et al.<sup>9</sup>, (Table 1) which grades the wound on a scale of 1–5, where 1 indicates very poor healing and 5 indicates excellent healing.<sup>9</sup>

**Table 1: Wound Healing Index which was used for assessing the wound healing of the sockets.**

Healing index	Tissue color	Bleeding on palpation	Granulation tissue	Incision margin	Suppuration
<b>1: Very Poor</b> Two or more signs are present	≥50% of red gingiva	Yes	Yes	Not epithelized, with loss of epithelium beyond incision margin	Yes
<b>2: Poor</b>	≥50% of red gingiva	Yes	Yes	Not epithelized, with exposed connective tissue	No
<b>3: Good</b>	25–50% of red gingiva	No	No	No exposed connective tissue	No
<b>4: Very Good</b>	< 25% of red gingiva	No	No	No exposed connective tissue	No
<b>5: Excellent</b>	All pink tissues	No	No	No exposed connective tissue	No

### Data Analysis:

The data were tested by descriptive data analysis using the Statistical Package for Social Sciences (SPSS, version 29) (IBM Corp., NY, USA).

### RESULTS:

Twenty-three cases were enrolled in our study from January 2022 to October 2023; 13 (56.5%) cases were male and 10 (43.5%) cases were female, and the mean age of all cases was 32 years with Std.

Deviation of 10.307. The details of the gender of individuals who participated in the research are presented in Table 2.

**Table 2: Gender of patients enrolled in the study.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<b>Male</b>	13	56.5	56.5	56.5
	<b>Female</b>	10	43.5	43.5	100.0
	<b>Total</b>	23	100.0	100.0	

**Table 3: Distribution of tooth extractions according to anterior, premolar and molar regions.**

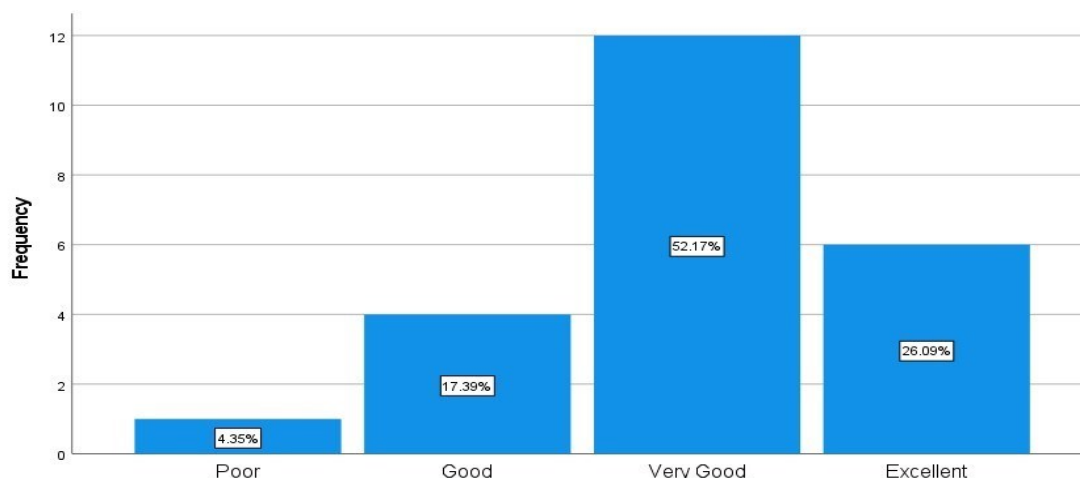
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Anterior Region	13	56.5	56.5	56.5
	Premolar Region	6	26.1	26.1	82.6
	Molar Region	4	17.4	17.4	100.0
	Total	23	100.0	100.0	

After a three months interval clinical success and complications of Extraction Socket Seal (ESS) technique for socket preservation were done and the wound healing of the socket was assessed. All the socket preservation approach followed in the research were successful except in one case. Regarding the evaluation of wound healing of the sockets after 3 months; healing index Landry et al. <sup>9</sup> was used and results showed that the mean score was (4: Very

good wound healing). The details of wound healing of the sockets among the twenty-three individuals who participated in the research are presented in Table 4 and depicted in Figures 8 and 9.

**Table 4: Results of wound healing of the sockets after 3 months using the healing index.**

	Frequency	Percent	Valid Percent	Cumulative Percent	Std. Deviation
1: Very poor	0	0	0	0	0.797
2: Poor	1	4.3	4.3	4.3	
3: Good	4	17.4	17.4	21.7	
4: Very Good	12	52.2	52.2	73.9	
5: Excellent	6	26.1	26.1	100.0	
Total	23	100.0	100.0		



**Figure 9: Bar chart showing the percentage of healing index among the samples.**

Most importantly, after 3 months peri-apical x-ray revealed healing of extraction sockets, and the soft tissue architecture is well preserved with an anatomically shaped

composite resin lid Figure 9.



**Figure 9:** Peri-apical x-ray after three months revealed healing of extraction socket, the soft tissue architecture is well preserved with an anatomically shaped composite resin lid (in this case with the shape of the cervical profile of molar tooth).

Regarding complications of the proposed technique, only 1 case of molar extraction was faced with a problem in which the composite lid (Extraction Socket Seal ESS) dislodged from the extraction socket after 2

weeks and lost its fixation to adjacent teeth. Table 5 shows the percentage of problems/ complications in the proposed technique of socket preservation.

**Table 5:** Rate of complications among 23 extractions.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Complications	22	95.7	95.7	95.7
	Complications	1	4.3	4.3	100.0
	Total	23	100.0	100.0	

And the complication that occurred goes to one of the early cases of the followed technique, and the problem was controlled and solved for all the cases by using enforcement the composite resin material with orthodontic retainer wire. Figure 10 illustrates

the use of orthodontic retainer wire for reinforcement of fixation of the composite lid (Extraction Socket Seal ESS) to adjacent teeth that are used for socket preservation of an extracted hopeless 2<sup>nd</sup> premolar.



**Figure 10:** Reinforcement of fixation of the composite lid (Extraction Socket Seal ESS) with adjacent teeth.





**Figure 11: Extraction Socket Seal (ESS) is used for socket preservation and as a temporary**

## DISCUSSION

Ridge preservation techniques have been extensively documented and proven to be successful in maintaining the dimensions of alveolar bone ridge anatomy.<sup>10</sup> Now a day, techniques involving a flapless approach are generally recommended as being more efficient with regards to hard tissue preservation. However, a potential drawback of these techniques is the tendency to establish a flat soft tissue architecture. As a result, more advanced and complex procedures of soft tissue manipulation procedures may be required at the time of implant placement or restoration.<sup>11,12</sup> Traditional socket preservation techniques have focused primarily on maintaining hard tissue dimensions, often neglecting the preservation of soft tissue anatomy. However, a novel technique presented in the research article focuses on addressing both aspects using a composite resin lid named Extraction Socket Seal (ESS) as a graft sealant and soft tissue cervical profile shape maintenance device.

The study conducted by the researchers aimed to evaluate the efficacy of this innovative approach for preserving alveolar ridge morphology. The technique involved a series of steps, including atraumatic tooth extraction, fabrication of a composite resin lid, socket cleaning, grafting, and fixation of the lid with adjacent teeth. This comprehensive approach ensured not only the

preservation of hard tissue dimensions, but also the maintenance of soft tissue cervical profile anatomy. One notable advantage of the proposed technique is its simplicity and time-saving nature. By utilizing a pre-fabricated composite resin lid, the clinicians were able to streamline the socket preservation procedure. Additionally, the use of the Cervico system facilitates the selection of the appropriate size and shape of the lid, ensuring optimal adaptation to the extraction socket. The study's findings demonstrated promising outcomes. Radiographic evaluation revealed good bone healing, indicating successful preservation of hard tissue dimensions. Importantly, the soft tissue architecture was well preserved, addressing a common concern with traditional socket preservation techniques. This preservation of soft tissue anatomy is crucial for achieving optimal aesthetic outcomes, especially in cases involving anterior teeth. Plus, to the benefits mentioned, it has another advantage when used in the anterior region of the mouth; the Extraction Socket Seal (ESS) can be used as a temporary tooth which increases the patient's satisfaction and saves time and cost for both of the patient and the operator Figure 11.

The low rate of complications observed in the study further highlights the reliability of the technique. The overall success rate was high, with only one case experiencing a lid fixation-related complication. Moreover, the researchers were able to address this issue by reinforcing the composite resin material with orthodontic retainer wire, ensuring long-term stability.

One of the limitations for the use of our protocol is in a clinical situation where the adjacent teeth are absent and we might fail to fix and connection of the composite lid. It is essential to highlight the importance of ensuring the stability of the composite resin lid during the healing process.

Overall, the findings of this study suggest that the novel technique for socket preservation offers a viable solution for preserving both hard and soft tissue dimensions following tooth extraction. By integrating composite resin lids into the preservation process, clinicians can achieve predictable outcomes with minimal complications. This approach has the potential to enhance the success of subsequent implant therapy by providing a favorable environment for implant placement.

## CONCLUSIONS

In conclusion, the Extraction Socket Seal (ESS) technique provides valuable insights into an innovative approach for socket preservation after tooth extraction. By focusing on the preservation of both hard and soft tissue dimensions, this approach represents a significant advancement in dental implantology. Further studies are needed with a larger number of samples to evaluate Extraction Socket Seal (ESS) technique for different clinical scenarios after tooth extraction.

## CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest relevant to this article.

## REFERENCES

- Vignoletti, F. Matesanz P, Rodrigo D, Figuero E, Martin C, Sanz M. Surgical protocols for ridge preservation after tooth extraction. A systematic review. *Clin. Oral Implants Res.* 2012; 23, 22 –38.
- Hämmerle, C. H. F., Araújo, M. G. & Simion, M. Evidence -based knowledge on the biology and treatment of extraction sockets. *Clin. Oral Implants Res.* 2012; 23, 80 –82.
- Schropp, L., Kostopoulos, L. & Wenzel, A. Bone healing following immediate versus delayed placement of titanium implants into extraction sockets: a prospective clinical study. *Int. J. Oral Maxillofac. Implants.* 2003;18, 189 –199.
- Araújo, M. G., Silva, C. O., Misawa, M. and Sukekava, F. Alveolar socket healing: what can we learn?. *Periodontology.* 2015; 68: 122 –134.
- Leblebicioglu, Binnaz & Rawal, Swati & Mariotti, Angelo. A review of the functional and esthetic requirements for dental implants. *Journal of the American Dental Association.* 2007;138. 321-9. 10.14219/jada.archive.2007.0164.
- Covani, U.; Ricci, M.; Bozzolo, G.; Mangano, F.; Zini, A.; Barone, A. Analysis of the pattern of the alveolar ridge remodelling following single tooth extraction. *Clin. Oral Implant. Res.* 2011; 22, 820–825.
- Avila -Ortiz, G. Rodriguez JC, Rudek I, Benavides E, Rios H, Wang HL. Effectiveness of Three Different Alveolar Ridge Preservation Techniques: A Pilot Randomized Controlled Trial. *Int. J. Periodontics Restorative Dent.* 2014; 34, 509 –521.
- Giannini, M., Makishi, P., Ayres, A. P. A., Vermelho, P. M., Fronza, B. M., Nikaido, T., & Tagami, J. Self-Etch Adhesive Systems: A Literature Review. *Brazilian Dental Journal.* 2015; 26 (1), 3–10. doi:10.1590/0103-6440201302442
- Landry RG, Turnbull RS, Howley T. Effectiveness of benzydamine HCl in the treatment of periodontal postsurgical patients. *Research in Clinic Forums* 1988; 10:105–118.
- Vittorini Orgeas G, Clementini M, De Risi V, de Sanctis M. Surgical techniques for alveolar socket preservation: a systematic review. *Int J Oral Maxillofac Implants.* 2013; Jul-Aug;28(4):1049-61.
- Bichacho N, Landsberg CJ. *Pract Periodontics Aesthet Dent.* 1994; May;6(4):35 41; quiz 41.
- Wittneben JG, Buser D, Belser UC, Brägger U. Peri-implant soft tissue conditioning with provisional restorations in the esthetic zone: the dynamic compression technique. *Int J Periodontics Restorative Dent.* 2013; JulAug;33(4):447-55.