BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 21, Issue 5

DOI: 10.58240/1829006X-2025.21.5-313

COMPARISON BETWEEN STANDARD PROTOCOL AND GUIDED BIOFILM THERAPY IN PROFESSIONAL ORAL HYGIENE

D'Amico Cesare[1], Andreini Eva [2], Tozzi Benedetta [2], Polici Prunela [3], Noor Toufiq [4], Gorassini Francesca [4-5], Rosa Alessio[6], Martelli Mirko [6]

[1] Department of Biomedical and Dental Sciences, Morphological and Functional Images, University of Messina, 98100 Messina, Italy; cdamico@unime.it (C.D.A.);

[2] U.O.C. of Dentistry "Fra G.B. Orsenigo" - San Pietro Fatebenefratelli Hospital, Rome, Italy

[3] Department of Medical Sciences, Catholic University Our Lady of Good Counsel, Tirana – Albania

[4] Department of Dental Research Cell, Dr. D. Y. Patil Dental College & Hospital, Dr. D. Y. Patil Vidyapeeth (Deemed to be University), Pimpri, Pune 411018, India. thisistoufiqnoor@gmail.com (T.N.)

[5] FiDent, Centro Medico Odontoiatrico, 89121 Reggio di Calabria, Italy gorassinifrancesca@gmail.com (F.G.)

[6]Department of Clinical Science and Translational Medicine - University of Rome Tor Vergata, Rome, Italy. dott.alessiorosa@gmail.com (A.R.)

Corresponding: Gorassini Francesca, FiDent, Centro Medico Odontoiatrico, 89121 Reggio di Calabria, Italy. gorassinifrancesca@gmail.com (F.G.)

Received: *May 25. 2025;* ***Accepted:*** *Jun 25, 2025;* ***Published:*** *Jun.30,2025*

ABSTRACT

Background: Professional oral hygiene is pivotal in preventing periodontal disease by eliminating supragingival and subgingival biofilm and calculus. While traditional methods are effective, they may induce discomfort and tissue trauma. Guided Biofilm Therapy (GBT) is a minimally invasive protocol designed to optimize biofilm removal while improving patient comfort and operator ergonomics.

Aim: This study compares the Standard Protocol and GBT in terms of clinical efficacy, patient-reported comfort, treatment duration, and operator experience

Materials and Methods: The Present in vitro study utilized six subjects' blood and was centrifugated. T-PRF clots were prepared, and TI/ NE gel extracts were injected and compared with T-PRF alone to check the release of Vit C, Az, and IGF 1 at 6hours, 72 hours (3rd), 7th, and 14th day. For statistical analysis, a paired t-test and ANOVA were performed. P value <0.05 was considered statistically significant.

Results: Over 98% of patients treated with GBT reported reduced or absent pain compared to traditional methods. GBT reduced treatment time by approximately 15% and was associated with improved plaque control, reduced bleeding, and lower probing depths. Operators reported reduced fatigue and improved ergonomics with GBT instrumentation.

Conclusions: GBT offers a clinically effective and patient-friendly alternative to conventional prophylaxis, combining enhanced comfort with efficient biofilm management. These findings support the integration of GBT into routine oral hygiene practice to optimize clinical outcomes and patient compliance.

Key Words: GBT, scaling, professional hygiene

1. INTRODUCTION

Periodontal disease is a multifactorial chronic inflammatory condition initiated by dysbiotic biofilm and influenced by systemic and local risk factors. Its effective management requires mechanical disruption of biofilm and patient adherence to preventive protocols. Traditional supragingival prophylaxis techniques—primarily manual or ultrasonic scaling—are often associated with discomfort, abrasiveness and variability in operator technique may limit their long-term efficacy and patient acceptance.[1-4] Guided Biofilm Therapy (GBT), developed by EMS, represents a structured, evidence-informed protocol to address these limitations. It integrates biofilm disclosing, air polishing with low-abrasive erythritol or glycine powders, selective use of ultrasonic devices, and patient education, all within a standardized eight-step workflow (1,5-7). This patient-friendly protocol emphasizes biofilm visualization and atraumatic debridement as central elements of modern periodontal maintenance. GBT is supported by recent literature demonstrating improvements in clinical outcomes and patient compliance. Clinical trials have shown reductions in bleeding on probing, plaque index, and gingival inflammation in patients treated with GBT compared to traditional methods[9-10]. Additionally, increased comfort and reduced procedural pain have been consistently reported, reinforcing its role in enhancing patient experience during hygiene sessions.

This study aims to assess the subjective response of patients undergoing GBT, with specific attention to comfort, pain, motivation, and overall satisfaction, using patient-reported outcome measures (PROMs).

2. MATERILAS AND METHODS

The findings aim to support the integration of GBT as a standard approach in prophylaxis, particularly for patients undergoing long-term periodontal maintenance.[11-12]

Figure 1. GBT technique

This comparative observational study enrolled adult patients in a professional oral hygiene recall program. Eligibility required good systemic health, the absence of periodontal conditions requiring surgical intervention, and informed consent. Patients were divided into two groups based on the hygiene protocol: the Standard Protocol group and the Guided Biofilm Therapy (GBT) group. The Standard Protocol included manual and ultrasonic scaling followed by rotary polishing using abrasive paste. The GBT protocol, in contrast, consisted of an eight-step sequence: medical history review, disclosing agent application for biofilm visualization, personalized hygiene instruction, air-polishing with erythritol powder via AirFlow®, subgingival instrumentation with PerioFlow® and Piezon® devices as needed, and final polishing. Each treatment was performed by experienced dental hygienists trained in both methods. Patient-reported experience was collected via a structured questionnaire assessing pain, comfort, noise level, and overall satisfaction using a 10-point Visual Analogue Scale (VAS). The operator recorded the treatment time. Ergonomic feedback was gathered through an operator-completed Likert scale regarding fatigue, posture, and instrument handling.Data were analyzed descriptively. Patient outcomes were compared qualitatively between groups, while ergonomic impact and efficiency were assessed from the operator's perspective.

Figure 2. Treatment with Guided Biofilm Therapy after plaque relief using colored relevant agents

3. RESULTS

The results of this observational study highlight a clear advantage of Guided Biofilm Therapy (GBT) over the Standard Protocol across all measured domains. Patients treated with GBT reported significantly lower pain levels, with an average VAS score of 1.8 (±0.6), compared to 5.8 (±0.9) in the control group. This substantial difference underscores the more atraumatic nature of the GBT approach.

In terms of perceived comfort during the procedure, GBT again outperformed the standard method. Patients rated their experience as markedly more comfortable, assigning an average score of 9.2 (±0.7) versus 6.5 (±1.1) for those treated with conventional scaling techniques. Similarly, noise sensitivity ratings favored GBT, with participants assigning it a mean score of 8.7 (±0.5), compared to 6.2 (±0.9) for the Standard Protocol, suggesting improved tolerability of the instrumentation used in GBT.

Overall treatment satisfaction was also higher in the GBT group, with an average score of 9.5 (±0.4) compared to 6.7 (±1.0) in the control group. Notably, a large majority—92%—of patients clearly preferred GBT and indicated they would choose it again for future sessions. This suggests that the subjective patient experience strongly favors the GBT approach.

Despite its structured workflow, the GBT protocol did not prolong treatment time. On the contrary, appointments were completed approximately 15% faster than with the standard protocol. This time efficiency likely results from the streamlined plaque removal process enabled by the AirFlow® system, which minimizes the need for prolonged mechanical instrumentation.

Lastly, the clinicians involved reported decreased physical strain and hand fatigue during GBT procedures.

4. DISCUSSION

The data showed that patients in the GBT group experienced significantly more favorable outcomes compared to the Standard Protocol group across multiple parameters. Pain levels reported during GBT were markedly lower, with a mean VAS pain score of 1.8, compared to 5.8 in the traditional group. The GBT

approach also received higher ratings for comfort (mean 9.2 vs 6.5), reduced perceived noise (8.7 vs 6.2), and greater overall satisfaction (9.5 vs 6.7) (Figure 3).

Patient motivation appeared enhanced by the disclosing phase of GBT, with many respondents noting that biofilm visualization helped them understand oral hygiene priorities more clearly. In addition, 92% of patients preferred GBT over traditional scaling methods (Figure 4), citing improved tolerability and reduced post-operative discomfort.[13-15]

Despite a more structured and multi-step approach, Treatment time was reduced by 15% in the GBT group. This efficiency may be attributable to the faster biofilm removal capacity of the AirFlow® device compared to manual instrumentation.[16-20]

Ergonomically, hygienists consistently rated GBT as less physically demanding. The design of the AirFlow® handpiece and the minimized need for repetitive manual scaling translated into reduced musculoskeletal strain, improved posture maintenance, and decreased session fatigue. Operator satisfaction aligns with existing literature supporting the ergonomic benefits of air-polishing systems in dental hygiene settings.

These findings complement prior clinical studies demonstrating that GBT significantly reduces bleeding on probing and gingival inflammation, with fewer adverse tissue effects due to the gentle action of erythritol and glycine powders[21,22]. Although this study was observational in nature, the consistency in subjective measures supports GBT's implementation in maintenance care. [23-24]

The data collected in this observational study support the clinical and experiential superiority of Guided Biofilm Therapy (GBT) over the Standard Protocol for professional oral hygiene. Across all measured domains—pain perception, comfort, noise sensitivity, satisfaction, treatment efficiency, and operator ergonomics—GBT consistently yielded more favorable outcomes.

Patient-Reported Outcomes

Pain was significantly reduced in the GBT group, with a mean VAS score of 1.8, compared to 5.8 in the Standard Protocol group. This aligns with prior findings demonstrating that air-polishing with erythritol powder induces less soft tissue trauma than traditional ultrasonic scaling (16,19). Similarly, patients rated GBT higher in comfort (9.2 vs 6.5), noise tolerance (8.7 vs 6.2), and overall satisfaction (9.5 vs 6.7). These values reflect the GBT workflow's less invasive, more predictable, and patient-centric nature.

An additional strength of GBT lies in its visual component. The disclosing phase enhanced patient

motivation by providing immediate biofeedback on biofilm presence. This educational aspect fosters behavioral reinforcement, as previously noted by Furrer et al. [19], who reported improved home care adherence in patients exposed to biofilm visualization. Furthermore, 92% of patients expressed a preference for GBT over conventional scaling, not only due to reduced procedural discomfort but also because of a lower incidence of post-treatment sensitivity and bleeding. This subjective preference supports the notion that PROMs are critical in determining patient compliance and return rates for maintenance therapy [13–15].

Clinical Efficiency and Operator Experience

Despite its structured eight-step design, GBT showed a 15% reduction in treatment time, likely due to the enhanced efficiency of air-polishing devices in biofilm disruption. The AirFlow® system, in particular, has been demonstrated to remove supragingival and subgingival plaque more uniformly and rapidly than manual methods [16,20].

From an ergonomic perspective, GBT reduced perceived fatigue among hygienists. Thanks to the lightweight and ergonomic design of the GBT instrumentation, operators reported improved posture and less hand strain. These findings are consistent with literature suggesting that repetitive manual scaling contributes to musculoskeletal disorders among dental professionals and that air-polishing can mitigate this risk [21].

Comparison with Literature

The present results corroborate previous clinical studies showing GBT's effectiveness in reducing bleeding on probing and gingival inflammation, likely due to the anti-inflammatory effects of erythritol and the atraumatic application technique [11,17,21]. Additionally, GBT may reduce the cumulative trauma associated with repeated instrumentation, especially important in patients with exposed root surfaces, restorations, or dental implants [15,17,23]. In the broader context of oral hygiene protocols, the adjunctive use of chemical agents plays a fundamental role in enhancing the effectiveness of mechanical plaque removal. Among these, stannous fluoride has demonstrated significant potential in terms of enamel protection, antimicrobial activity, and reduction of gingival inflammation. A systematic review has recently summarized its multifactorial benefits, supporting its integration within routine oral hygiene regimens, particularly for patients undergoing scaling procedures or at high risk for caries and erosion. Furthermore, it should be acknowledged that the long- term success of periodontal and peri-implant maintenance protocols—particularly in patients rehabilitated with implant-supported prostheses—relies not only on professional debridement and oral hygiene measures, but also on patient satisfaction, compliance, and prosthetic stability.

Recent clinical studies have investigated aspects such as the longevity of implant- retained overdentures and the application of fully digital workflows in implant-supported restorations, which can significantly influence plaque control and access to hygiene procedures in the long term. Moreover, the prevention and management of enamel demineralization phenomena, such as white spot lesions, represent a critical endpoint in the continuum of care related to oral hygiene. These lesions often result from inadequate plaque control and are frequently observed in patients undergoing orthodontic treatment or those with poor compliance with oral hygiene instructions. Recent systematic reviews have emphasized the importance of early detection and the integration of non-invasive therapeutic strategies as part of a comprehensive hygiene protocol. In the broader context of emerging biofilm control strategies, recent investigations have highlighted the potential of adjunctive therapies such as ozonated olive oil in modulating oral microbiota, reducing inflammation, and enhancing mucosal healing. These approaches align with minimally invasive, patient- centered dentistry principles and may complement mechanical debridement methods in selected clinical scenarios [24-29].

While the study's observational nature precludes definitive causal inferences, aligning subjective outcomes with GBT's mechanistic advantages lends credibility to its implementation in maintenance protocols.

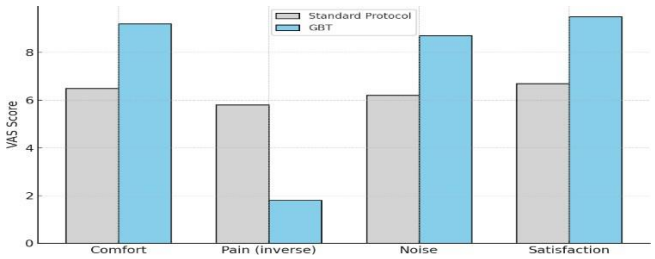

Figure 3. Comparison of mean VAS scores (0–10) across four categories: comfort, pain (inverted scale), noise perception, and overall satisfaction between GBT and Standard Protocol groups.

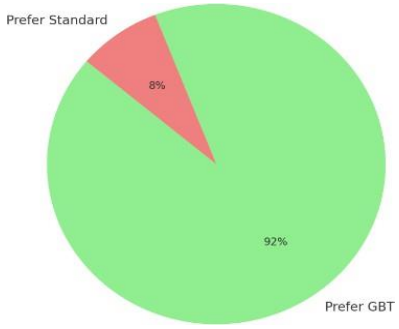

Figure 4. of patient preference between Guided Biofilm Therapy and the traditional standard protocol after undergoing hygiene treatment.

4. CONCLUSION

This observational study confirms that Guided Biofilm Therapy (GBT) provides a superior patient experience and greater clinical efficiency compared to the standard protocol for professional oral hygiene. The statistically and clinically significant differences in pain perception, comfort, satisfaction, and treatment time highlight GBT as a more favorable approach from both the patient's and operator's perspective.

Patients treated with GBT consistently reported lower discomfort and greater tolerance to instrumentation and noise. The visual disclosing phase and use of minimally invasive devices contributed to increased patient engagement and adherence, elements that are often overlooked in traditional hygiene protocols. The high preference rate for GBT suggests that patient-reported outcomes should be more routinely considered in evaluating maintenance strategies.

In addition, the ergonomic benefits observed by the clinical staff, such as reduced hand fatigue and shorter appointment duration, suggest that GBT may contribute to long-term occupational health among oral health professionals.

Clinical Recommendations

- GBT should be considered the standard of care in periodontal maintenance, especially in patients with dentinal sensitivity, restorative work, or implant-supported prostheses.
- Dental hygienists and clinicians should be trained in GBT to ensure protocol fidelity and maximize its ergonomic and biological benefits.
- Future studies should aim to validate these findings in randomized controlled trials with longer follow-up and clinical endpoints such as bleeding on probing, plaque index, and probing depth.

Incorporating PROMs as a routine measure of treatment success is strongly recommended, as they capture dimensions of care quality that go beyond mechanical biofilm removal and directly impact patient loyalty, motivation, and health outcomes.

DECLARATIONS

Acknowledgements

None

Conflicts of interest and financial disclosures

The authors declare no conflict of interest, and there was no external source of funding

Ethical approval

Approval for the conduction of the study was obtained from the Institutional Scientific Review Board (SRB/SDC/PhD/PERIO-2251/25/025).

Informed Consent

Verbal and written informed consent were obtained from healthy volunteers

REFERENCES

1. Axelsson P, Lindhe J. Effect of controlled oral hygiene procedures on caries and periodontal disease in adults: Results after 6 years. J Clin Periodontol. 1981;8(3):239-248. DOI: 10.1111/ j.1600-051x.1981.tb02035.x.
2. Rosa A, Cianconi G, De Angelis R, Pujia AM and Arcuri C (2025) Hypovitaminosis and its association with recurrent aphthous stomatitis: a comprehensive review of clinical correlations and diagnostic considerations. Front. Oral. Health 6:1520067. doi: 10.3389/froh.2025.1520067
3. Bastendorf KD, Strafela Bastendorf N, Lussi A. Mechanical Removal of the Biofilm: Is the Curette Still the Gold Standard? Monogr Oral Sci. 2021;29:105-118. DOI: 10.1159/000510187.
4. Gianfreda F, Bollero P, Muzzi M, Di Giulio A, Nicolai E, Canullo L. The Effects of Ultrasonic Scaling and Air-Abrasive Powders on the Decontamination of 9 Implant-Abutment Surfaces: Scanning Electron Analysis and In Vitro Study. Dent J (Basel). 2022 Mar 1;10(3):36. doi: 10.3390/dj10030036. PMID: 35323237; PMCID: PMC8947291.
5. Barlattani A Jr, Martelli M, Ceruso FM, Gargari M, Ottria L. Convergent implant transmucosal collar and healing abutment: aesthetics influence on soft tissues. A clinical study. J Biol Regul Homeost Agents. 2020;34(1):63 - 69. DENTAL SUPPLEMENT.

6.Minervini G, Franco R, Di Blasio M, Martelli M, Gargari M, Bollero P, Cicciù M. Prevalence of bruxism in patients affected by epilepsy: a systematic review and meta-analysis. Acta Odontol Scand. 2025 Apr 2;84:155-164. doi: 10.2340/aos.v84.42959. PMID: 40171773; PMCID: PMC12056371.
7.Pomella, S.; Melaiu, O.; Dri, M.; Martelli, M.; Gargari, M.; Barillari, G. Effects of Angiogenic Factors on the Epithelial-to-Mesenchymal Transition and Their Impact on the Onset and Progression of Oral Squamous Cell Carcinoma: An Overview. Cells 2024, 13, 1294. https://doi.org/10.3390/cells13151294
8.Minervini G, Franco R, Martelli M, Hafedh S, Maddalena Marrapodi M, Di Blasio M, Bollero P, Cicciù M. Low-level laser treatment's ability to reduce dry socket pain. Acta Odontol Scand. 2024 Nov 12;83:631-641. doi:

10.2340/aos.v83.42261
9.Petersilka GJ, Bell M, Häberlein I, et al. In vitro evaluation of novel low-abrasive air-polishing powders. J Clin Periodontol. 2003;30(1):9-13. DOI: 10.1034/ j.1600-051x.2003.300102.x.
10.Barlattani A Jr, Martelli M, Gargari M, Ottria L. Articular disc of temporomandibular joint: an anatomical and histological study. Functional considerations. J Biol Regul Homeost Agents. 2019 Nov-Dec;33(6 Suppl. 2):199-208. PMID: 32338474.
11.Moëne R, Décaillet F, Andersen E, Mombelli A. Subgingival plaque removal using a new air-polishing device. J Periodontol. 2010;81(1):79-88. DOI: 10.1902/jop.2009.090394.
12 . Rosa, A., De Angelis, R., Pujia, A. M., Cardelli, P., & Arcuri, C. (2025). Virtual reality in specialized dentistry: employing virtual reality for the alleviation of pain and anxiety in hereditary angioedema patients. Minerva dental and oral science, 74(1), 20–25. https://doi.org/10.23736/S2724-6329.24.04961-1
13 Rosa, A., Franco, R., Miranda, M., Casella, S., D'Amico, C., Fiorillo, L., & Cervino, G. (2023). The role of anxiety in patients with hereditary angioedema during oral treatment: a narrative review. Frontiers in oral health, 4, 1257703. https://doi.org/10.3389/froh.2023.1257703
14 Rosa, A., Miranda, M., Franco, R., Guarino, M. G., Barlattani, A., Jr, & Bollero, P. (2016). Experimental protocol of dental procedures In patients with hereditary angioedema: the role of anxiety and the use of nitrogen oxide. ORAL & implantology, 9(2), 49–53. https://doi.org/10.11138/orl/2016.9.2.049
15. Gianfreda F, Marenzi G, Nicolai E, Muzzi M, Bari M, Bernardini S, Adamo D, Miniello A, Sammartino G, Bollero P. The Effects of Ultrasonic Scaling and Air-Abrasive Powders on the Topography of Implant Surfaces: Scanning Electron Analysis and In Vitro Study. Eur J Dent. 2024 Oct;18(4):1107-1115. doi: 10.1055/s-0044-1782190. Epub 2024 May
16. Vouros I, Antonoglou GN, Anoixiadou S, et al. A novel biofilm removal approach (Guided Biofilm Therapy) utilizing erythritol air-polishing and ultrasonic piezo instrumentation: A randomized controlled trial. Int J Dent Hyg. 2022;20(2):381-390. DOI: 10.1111/idh.12533
17. Gianfreda F, Punzo A, Pistilli V, Bollero P, Cervino G, D'Amico C, Cairo F, Cicciù M. Electrolytic Cleaning and Regenerative Therapy of Peri-implantitis in the Esthetic Area: A Case Report. Eur J Dent. 2022 Oct;16(4):950-956. doi: 10.1055/s-0042-1750773
18. Rosa A, Pujia AM, Arcuri C. Hyaluronic Acid Combined with Ozone in Dental Practice. Biomedicines. 2024;12(11):2522. https://doi.org/10.3390/biomedicines12112522
19.Furrer C, Bättig R, Votta I, Schmidlin PR. Patient acceptance after switching to Guided Biofilm Therapy. Swiss Dent J. 2021;131(3):229-234.
20.Volgenant CMC, Fernandez y Mostajo M, Rosema NAM et al. Comparison of red autofluorescing plaque and disclosed plaque – a cross-sectional study. Clin Oral Invest 20, 2551–2558 (2016).
21.A. Barlattani JR, R. Franco, M. Martelli, F. Gianfreda, R. Ferro, M. Basili, P. Bollero, Guided Bone Regeneration in Patients Taking Biphosphonates: Two Cases Series, Oral and Implantology, (Rome) 2019;12:194- 204.
22.Meisel P, Schwahn C, John U, Kroemer HK, Kocher T. Calcium antagonists and deep gingival pockets in the population-based SHIP study. Br J Clin Pharmacol. 2005 Nov;60(5):552-9.doi:10.1111/j.1365-2125.2005.02485.x.
23.Ceruso, F.M.; Ieria, I.; Martelli, M.; Lumbau, A.I.; Xhanari, E.; Gargari, M. New Generation of Fixture–Abutment Connection Combining Soft Tissue Design and Vertical Screw-Retained Restoration: 1-Year Clinical, Aesthetics and Radiographic Preliminary Evaluation. Dent. J. 2021, 9, 35. https://doi.org/10.3390/dj9040035
24.Rosa A, Fiorillo L, D'Amico C, et al. Local Anesthetic-Induced Allergic Reactions in Dentistry: Current Perspectives and Key Considerations. Bulletin of Stomatology and Maxillofacial Surgery. 2024;20(3):93-102. doi:10.58240/1829006X2024.3-93
25.Scarano, A.; Inchingolo, F.; Alla, I.; Lorusso, F.; Tari, S.; Gehrke, S.; Khater, A. Patients' Satisfaction with Mandibular Overdentures Retained Using Mini-Implants: An Up-to-16-Year Cross-Sectional Study. Prosthesis 2024,6(2),251-262; https://doi.org/10.3390/prosthesis6020019.
26.Puleio F, Fiorillo L, Gorassini F, Iandolo A, Meto A, D'Amico C, Cervino G, Pinizzotto M, Bruno G, Portelli M, Amato A, Lo Giudice R. Systematic Review on White Spot Lesions Treatments. Eur J Dent. 2022 Feb;16(1):41-48. doi: 10.1055/s-0041-1731931.
27.Fiorillo, L.; Cervino, G.; Herford, A.S.; Laino, L.; Cicciù, M. Stannous Fluoride Effects on Enamel: A Systematic Review. Biomimetics 2020, 5, 41. https://doi.org/10.3390/biomimetics5030041
28. D'Amico C, Galletti F, Ronsivalle V, Noor T, Amekpor F, Gorassini F, Cervino G. Ozonated olive oil effects in dentistry: an RCT results overview. *J Dent Multidiscip Sci*. 2025;1(1).
29. Sorrentino, R.; Di Mauro, M.; Ruggiero, G.; Leone, R.; Ferrari Cagidiaco, E.; Annunziata, M.; Ferrari, M.; Zarone, F. Implant-Prosthetic Rehabilitation of the Agenesis of Maxillary Lateral Incisors: A 2-Year Prospective Clinical Study with Full Digital Workflow. Prosthesis 2024, 6(4), 803-816; https://doi.org/10.3390/prosthesis6040057.