

Treatment of Peri-implant Mucositis and Supportive Peri-implant Therapy Using an Erythritol Air-polishing Device vs. Conventional Mechanical Instrumentation. A 6-month Randomized Controlled Clinical Trial

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M Background

- Peri-implant mucositis is highly prevalent, affecting approximately 40–50% of implant patients and posing a significant clinical concern. Dental biofilm is the primary etiological factor; effective biofilm removal is essential for prevention and management. Conventional treatment relies on mechanical debridement, while adjunctive antimicrobials offer limited additional benefit.
- Erythritol-based air-polishing systems demonstrate low abrasiveness, antimicrobial properties, and safety on implant surfaces. Limited clinical evidence exists comparing erythritol air-polishing with conventional ultrasonic instrumentation. Biomarkers such as MMP-8 and microbiome analysis may enhance assessment of inflammatory resolution and treatment efficacy.

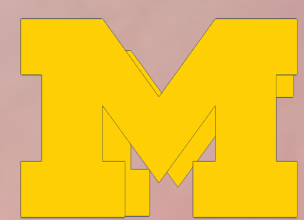
Objectives

Primary-

To compare clinical outcomes of the non-surgical treatment of peri-implant mucositis and subsequent supportive peri-implant therapy (SPIT) using an erythritol air-polishing device or conventional mechanical debridement.

Secondary-

1. To compare the resolution of inflammation and the amount of periodontal pathogens after non-surgical treatment of peri-implant mucositis

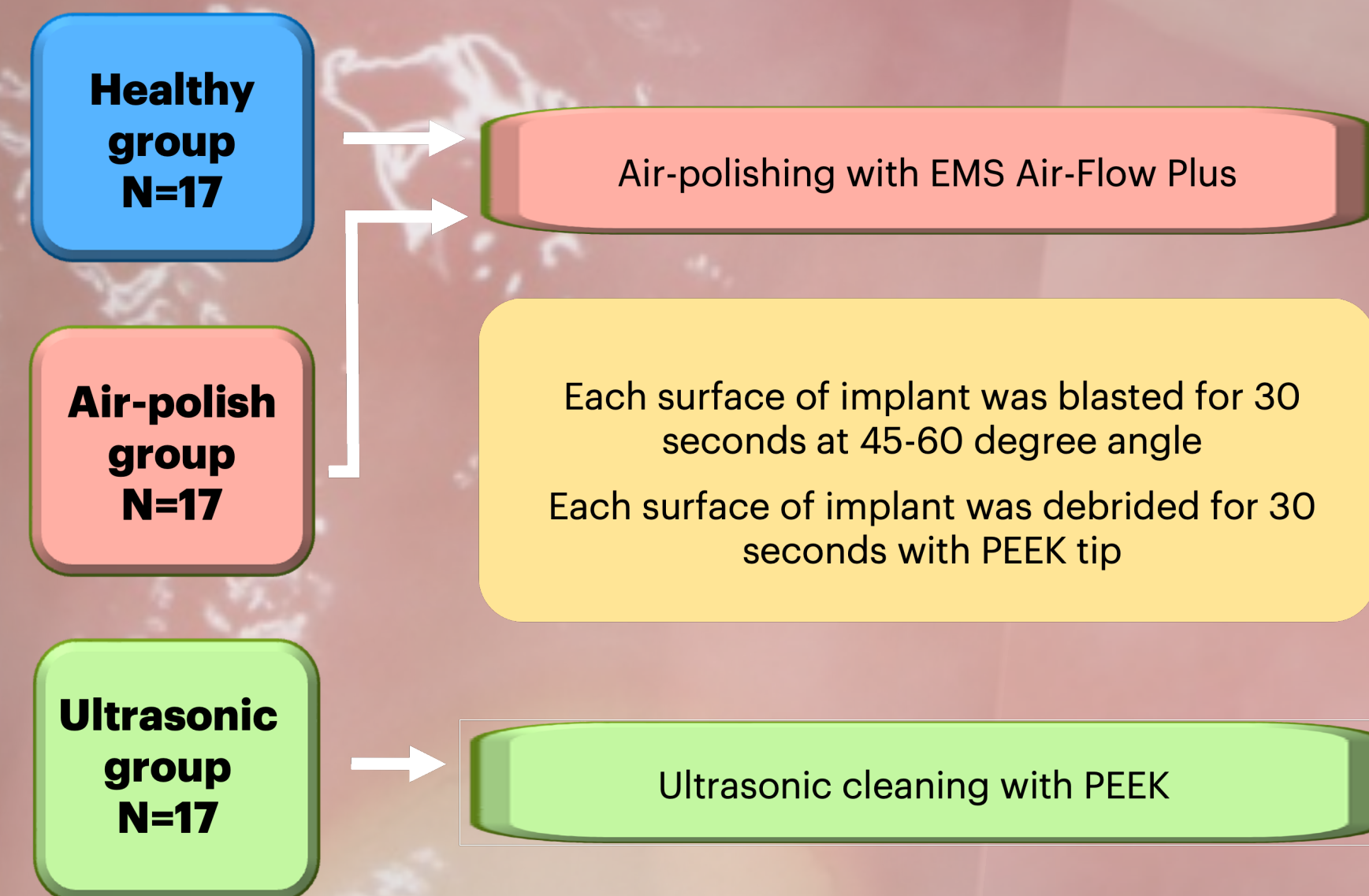
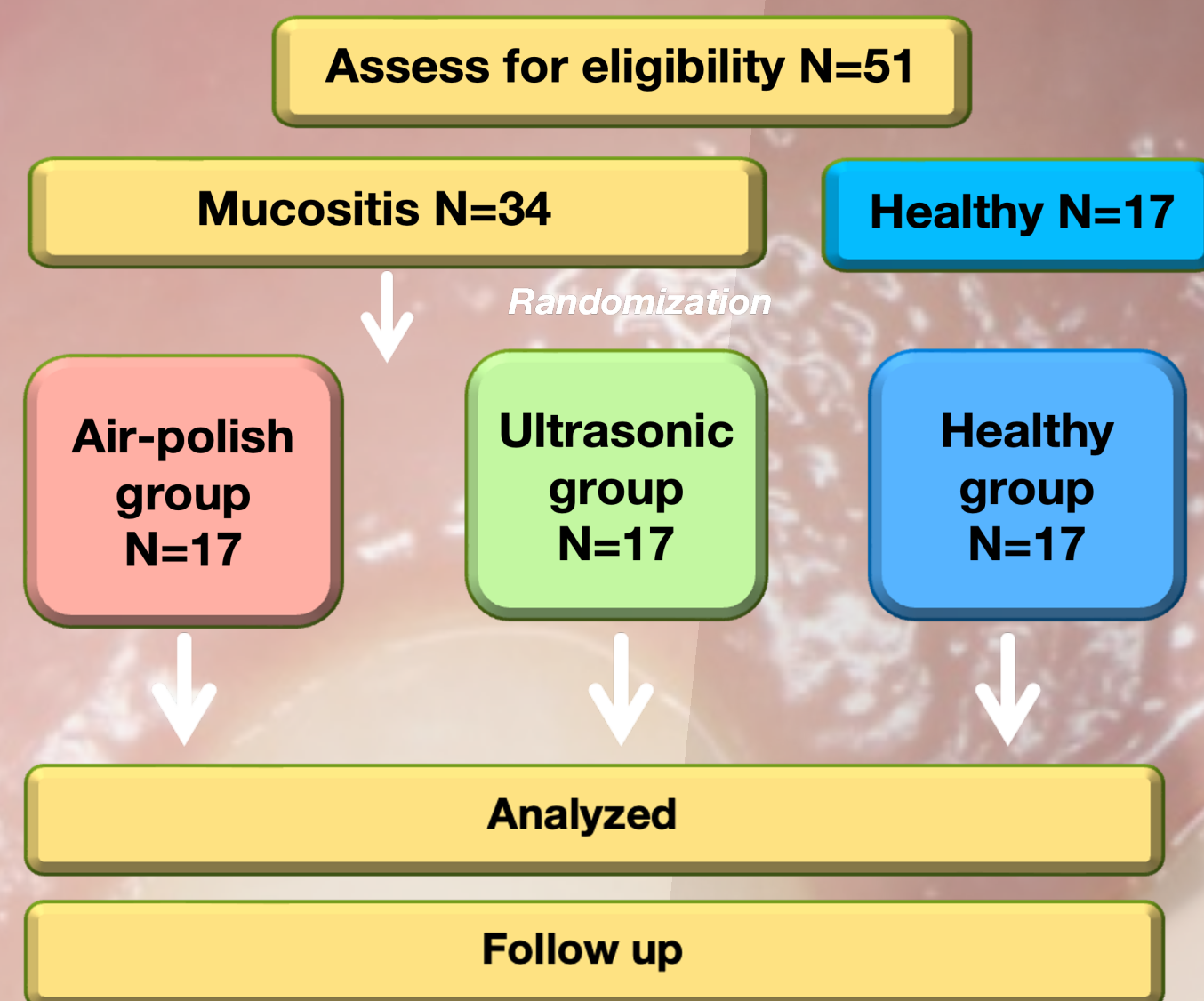


Materials and Methods

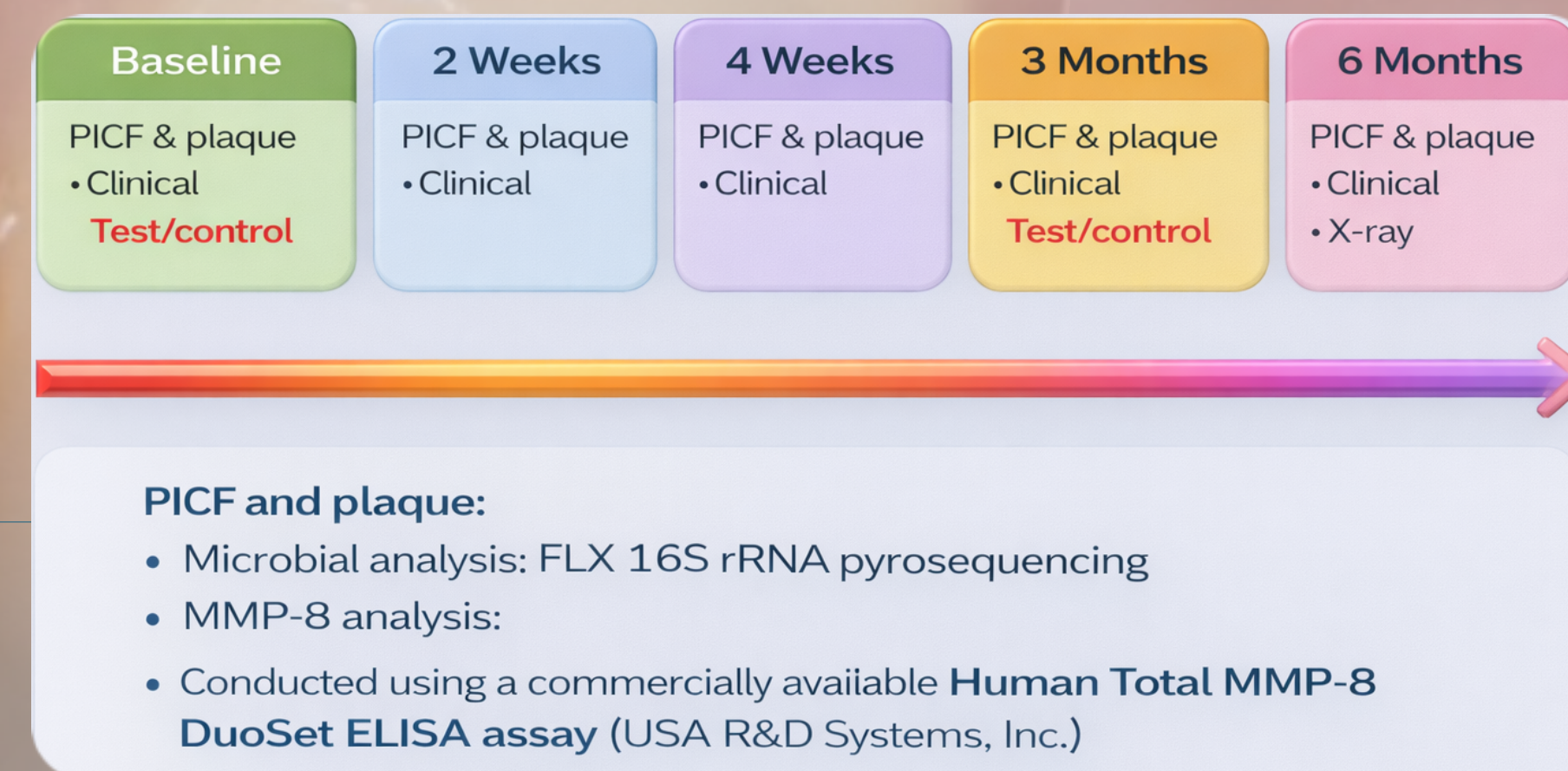


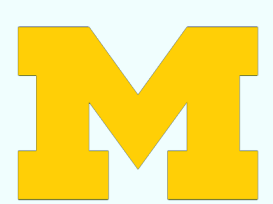
~ *Single blinded, randomized controlled trial*

Study Design



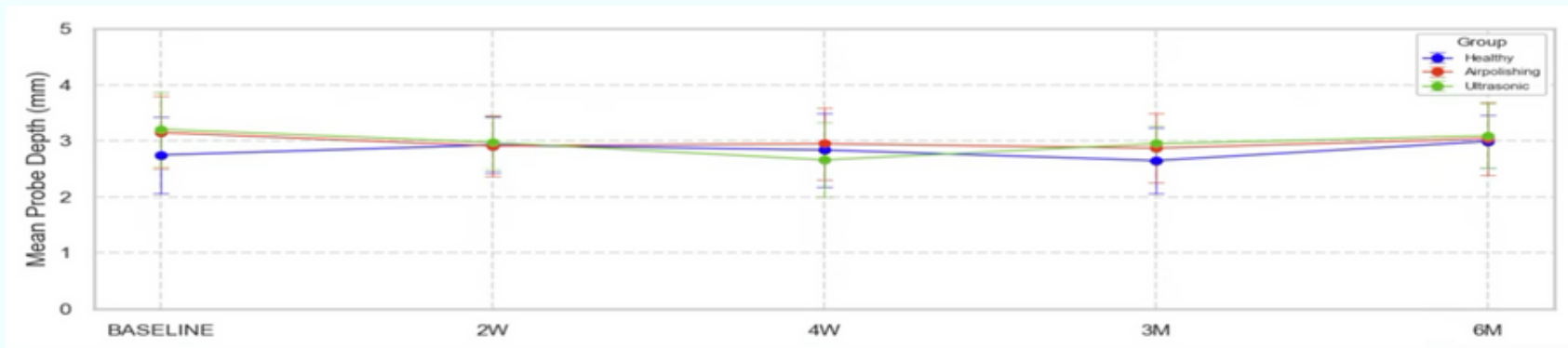
Data Collection



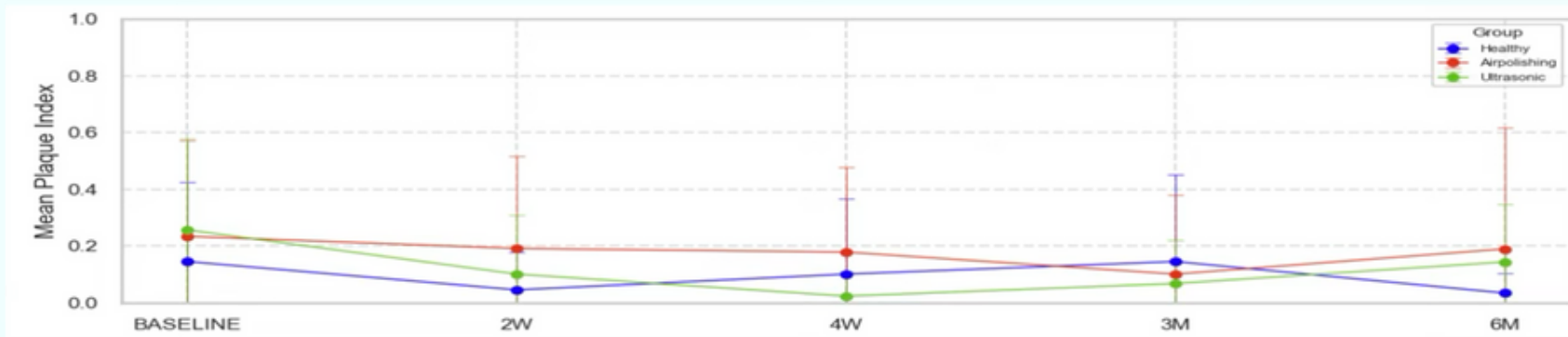


Results - Clinical Findings

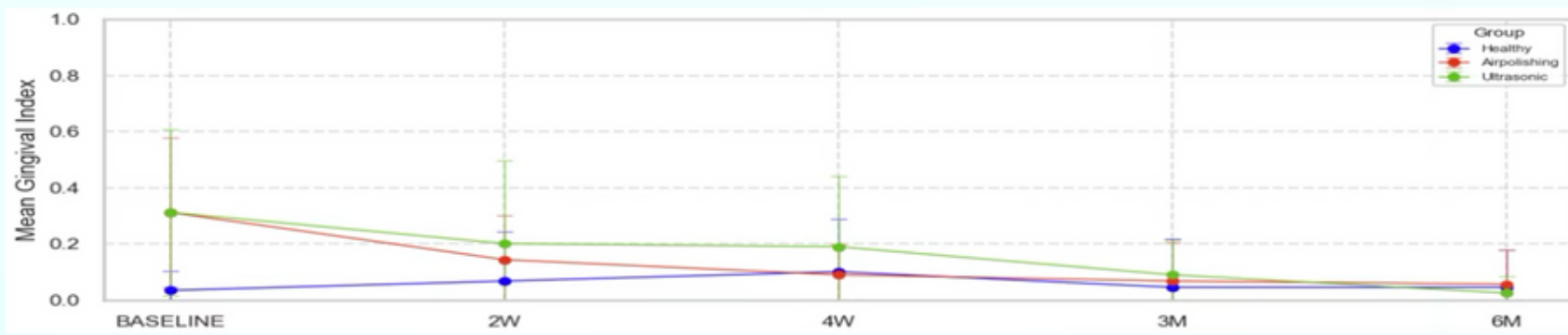
PD



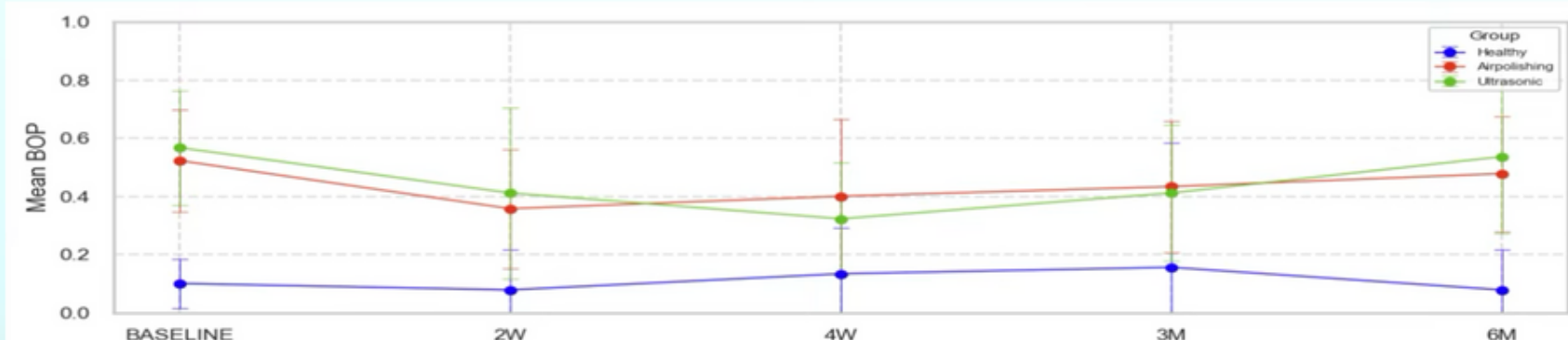
PI



GI



BOP



Rec

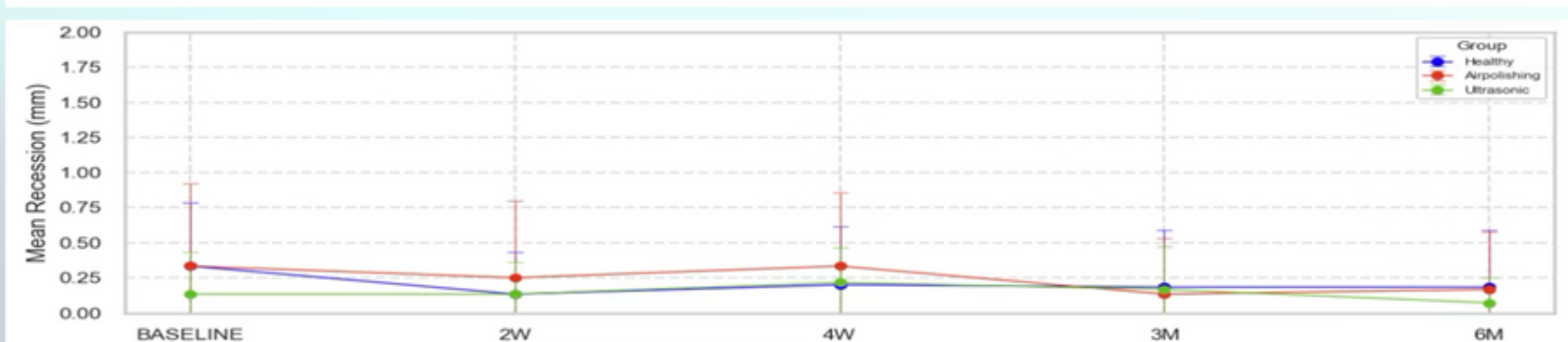


Figure 1. Longitudinal changes in clinical peri-implant parameters across study groups.

Baseline, 2, 4 weeks, 3, and 6 months, the mean $\pm$ standard deviation of probing depth (PD), plaque index (PI), gingival index (GI), bleeding on probing (BOP), and gingival recession (REC) were recorded for the Healthy, Air-polishing, and Ultrasonic groups. No significant intergroup differences were found at any follow-up. Intragroup, no significant changes in PD, PI, or REC occurred from baseline. Both mucositis groups showed a decrease in GI over time, and BOP tended to be lower at 2 and 4 weeks, though not significantly.

PROM

0

No pain

10

Worst pain ever

	Baseline (VAS1)	6 months (VAS2)
Healthy	1.0 $\pm$ 1.1	0.6 $\pm$ 0.8
Air-polishing	1.6 $\pm$ 2.3	1.3 $\pm$ 1.4
Ultrasonics	2.3 $\pm$ 1.7	1.1 $\pm$ 1.5

Figure 2. Patient-reported pain on a 0-10 VAS at baseline and 6 months for Healthy, Air-polishing, and Ultrasonic groups.

Values are mean $\pm$ SD. All groups showed low pain scores, with a general reduction at 6 months.

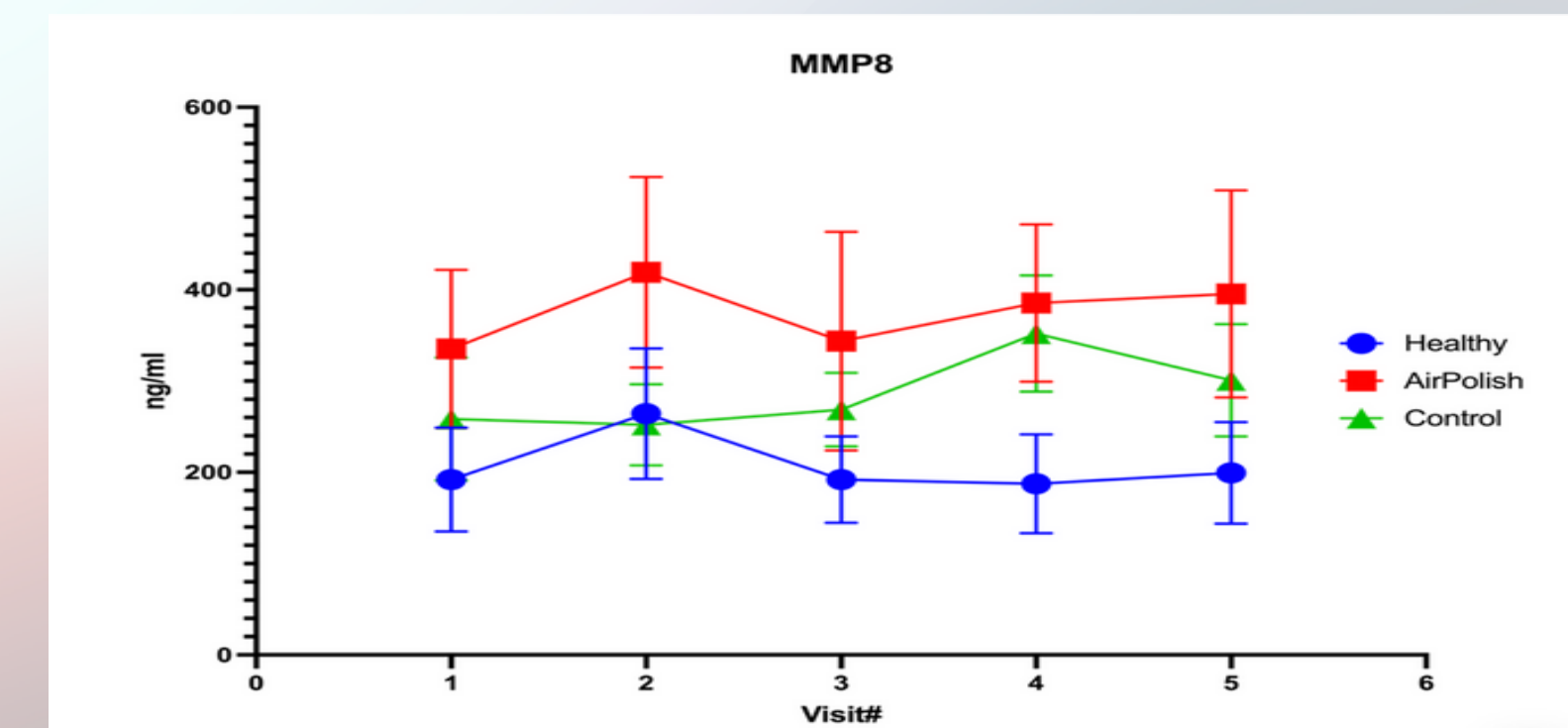


Figure 3- Patient-reported pain on a 0-10 VAS at baseline and 6 months for Healthy, Air-polishing, and Ultrasonic groups.

MMP-8 concentrations in peri-implant crevicular fluid remained stable across all follow-up visits and did not differ significantly among the healthy, air-polishing, and ultrasonic groups. Although the healthy group consistently exhibited lower mean MMP-8 levels,

Microbiological Findings

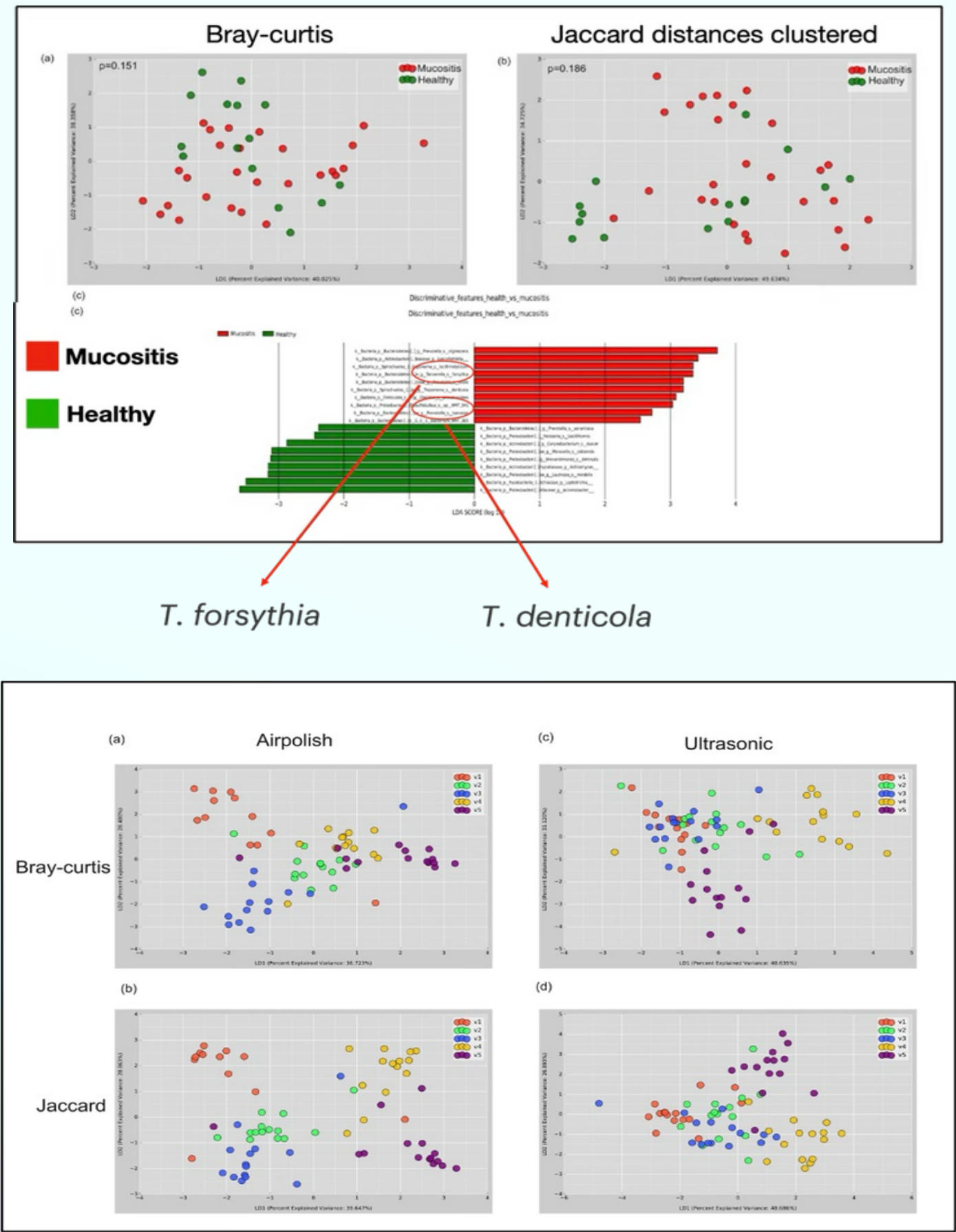


Figure 4. Microbial community composition at baseline and following treatment assessed by multivariate analyses.

LDA of Bray–Curtis and Jaccard distances showed no significant clustering between healthy and peri-implant mucositis sites at baseline ($p = 0.151$ and $p = 0.186$). LEfSe analysis found differentially abundant taxa, including *T. forsythia* and *T. denticola*, enriched in mucositis. Longitudinal microbiota analyses following air polishing and ultrasonic debridement showed no significant changes in microbial composition across treatments or time points, using Bray–Curtis or Jaccard metrics.

Figure 5 - LEfSe analysis of differentially abundant bacterial taxa among study groups at follow-up visits.

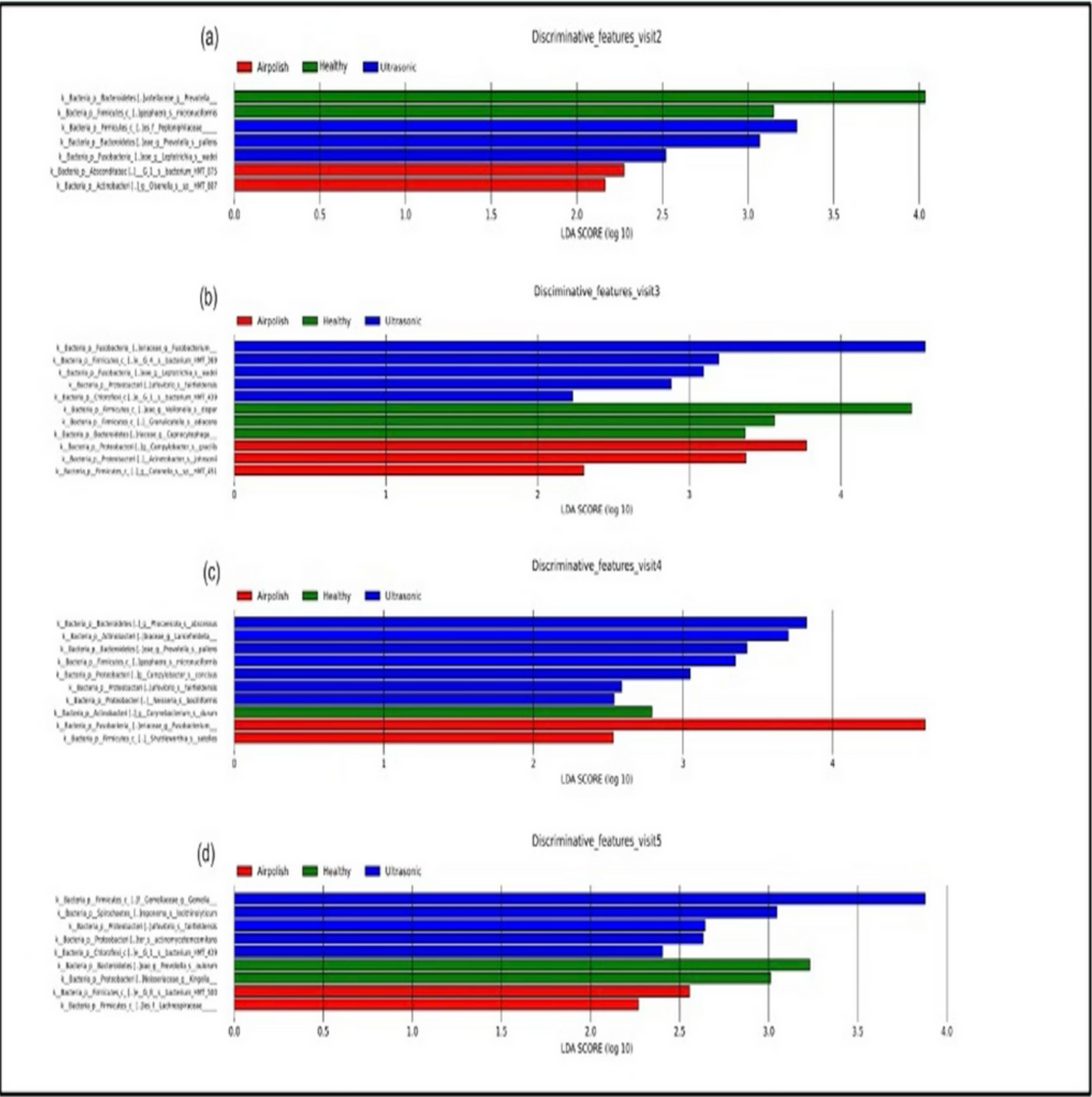
LEfSe identified bacterial taxa with significantly different relative abundances among the Healthy (green), Air-polishing (red), and Ultrasonic (blue) groups at visits V2, V3, V4, and V5. Horizontal bar plots show the LDA scores of discriminative features at each time point. Although distinct taxa appeared at individual visits, no consistent microbial pattern emerged across treatments over time.

V2

V3

V4

V5



Healthy
Air-polishing
Ultrasonic

Conclusions

Erythritol air-polishing demonstrated clinical and microbiological effectiveness comparable to ultrasonic debridement for the treatment of peri-implant mucositis. Both approaches improved mucosal health and reduced inflammation, but did not achieve complete resolution, reflecting the multifactorial nature of peri-implant disease. Given its efficiency, patient comfort, and clinical practicality, air-polishing represents a valuable alternative in peri-implant maintenance therapy.