High Frequency Ultrasound Diagnosis Of An Advanced Peri-Implantitis Case In The Esthetic Zone

Praewvanit Asavanamuang, DDS[1], Piyarat Sirirattanagool, DDS[1],
Ekaterini Antonellou, DDS, DMD, MSc, FACP[1], Maria Elisa Galarraga-Vinueza, DDS, MSc, PhD[1]

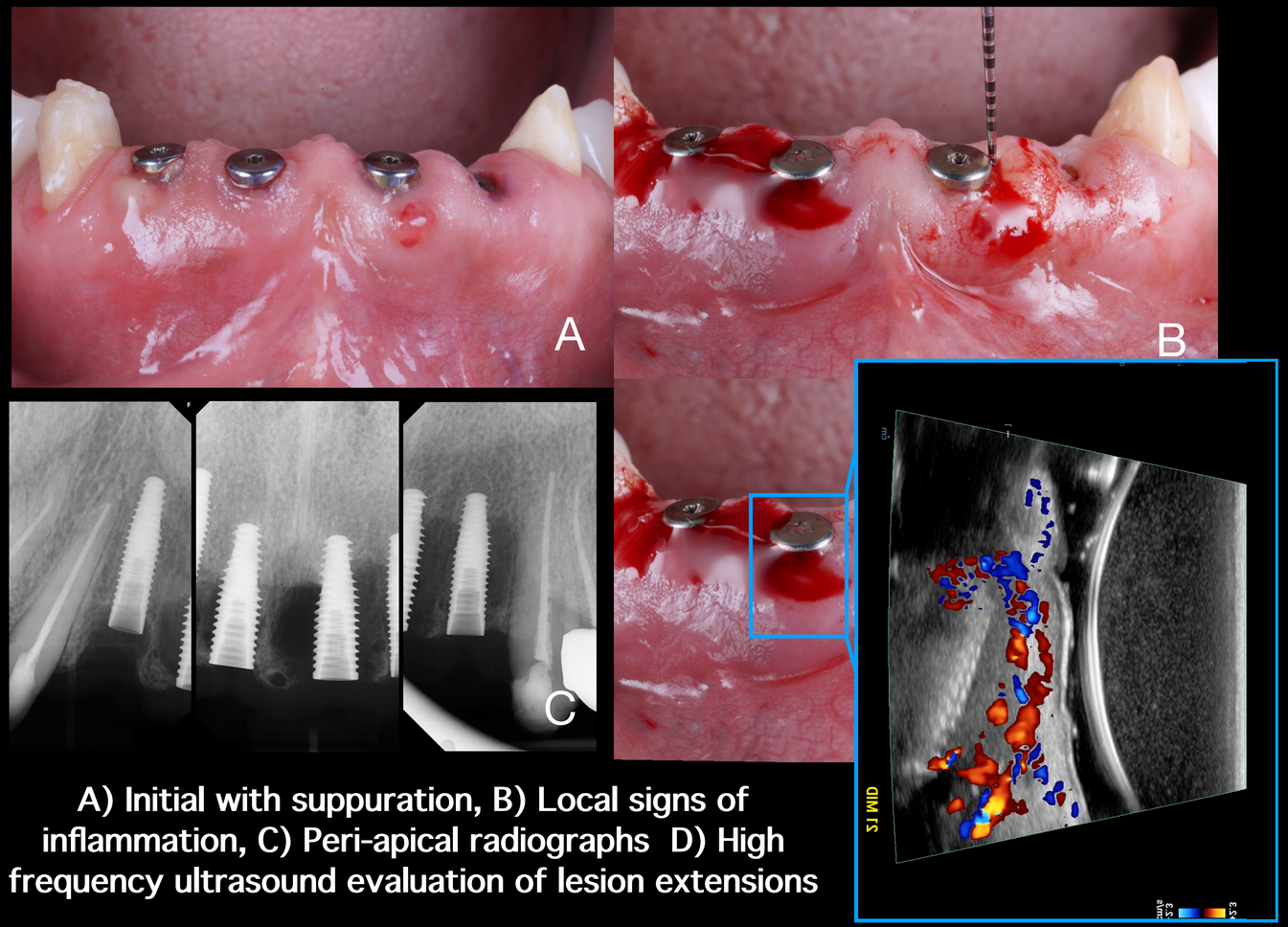
[1]Department of Prosthodontics, Tufts University School of Dental Medicine, Boston, USA

INTRODUCTION

Peri-implant diseases are inflammatory conditions that originate in the soft tissue compartment and are associated with bacterial challenges around functioning dental implants.[1]

Although a consensus to distinguish peri-implant mucositis and peri-implantitis has been established, ambiguity still remains from lack of discernment between transitory phases and disease progression.[2]

This case report aims to propose a novel, non-invasive diagnostic tool to visualize inflammation and lesion extension in advance peri-implantitis case and offer future cutting-point for diagnosis.



A) Initial with suppuration, B) Local signs of inflammation, C) Peri-apical radiographs D) High frequency ultrasound evaluation of lesion extensions

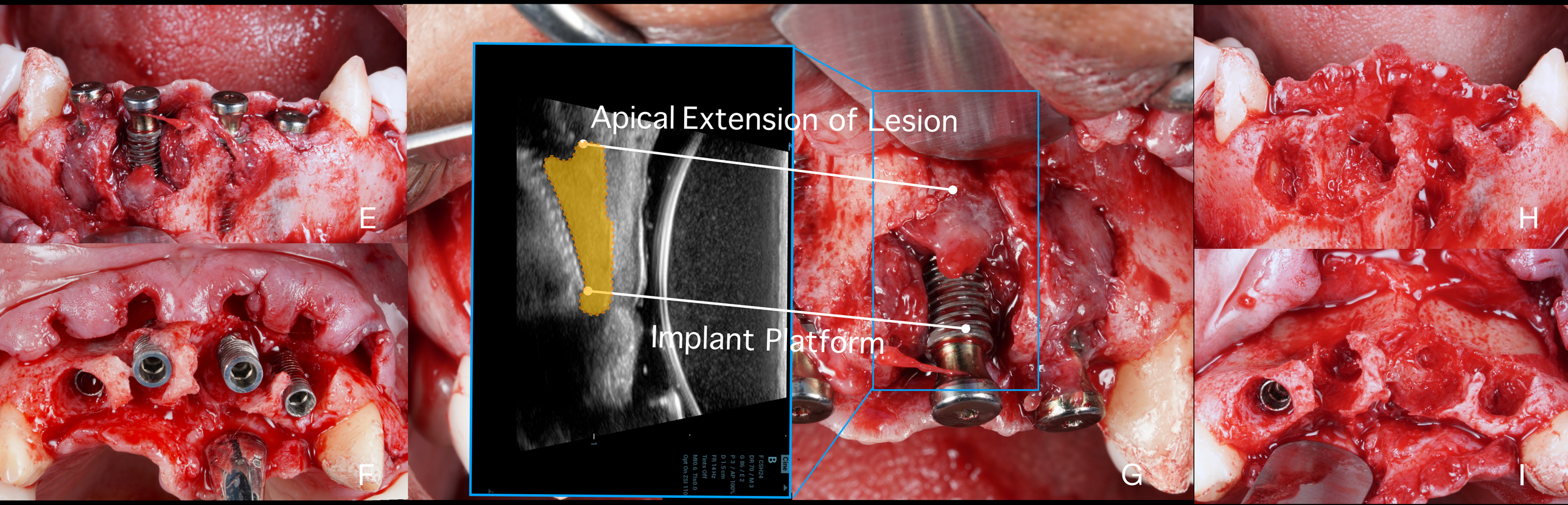
METHOD

A 59-year-old female patient presented to the clinic with pain, swelling, and suppuration at her implants in the maxillary anterior region. High frequency ultrasound (HFUS) was used to evaluate peri-implant health through real-time dynamic imaging. This method offered explicit assessment of lesion extension, especially of the mid-buccal region; a blind spot in conventional radiographic images.[2,3,5]

High Frequency Ultrasound Diagnosis Of An Advanced Peri-Implantitis Case In The Esthetic Zone

Praewvanit Asavanamuang, DDS[1], Piyarat Sirirattanagool, DDS[1],
Ekaterini Antonellou, DDS, DMD, MSc, FACP[1], Maria Elisa Galarraga-Vinueza, DDS, MSc, PhD[1]

[1]Department of Prosthodontics, Tufts University School of Dental Medicine, Boston, USA

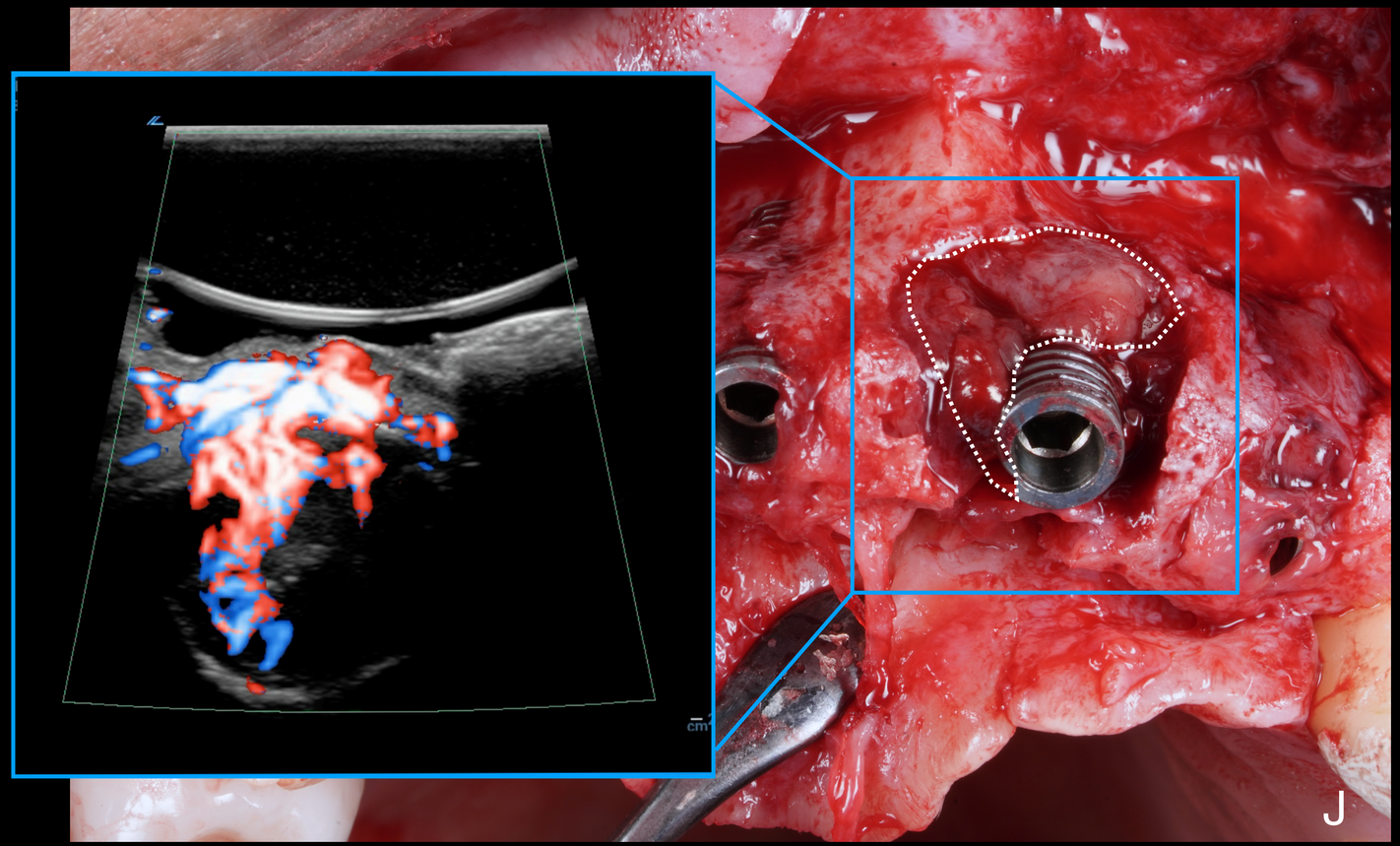


E,F) Advanced peri-implantitis G) High frequency ultrasound evaluation of lesion extensions revealing the affected buccal soft tissue compartment H,I) Surgical removal of implants

High Frequency Ultrasound Diagnosis Of An Advanced Peri-Implantitis Case In The Esthetic Zone

Praewvanit Asavanamuang, DDS[1], Piyarat Sirirattanagool, DDS[1],
Ekaterini Antonellou, DDS, DMD, MSc, FACP[1], Maria Elisa Galarraga-Vinueza, DDS, MSc, PhD[1]

[1]Department of Prosthodontics, Tufts University School of Dental Medicine, Boston, USA



J) High power doppler ultrasound imaging demonstrating high level of inflammation from the buccal to the palatal aspect of the Implant

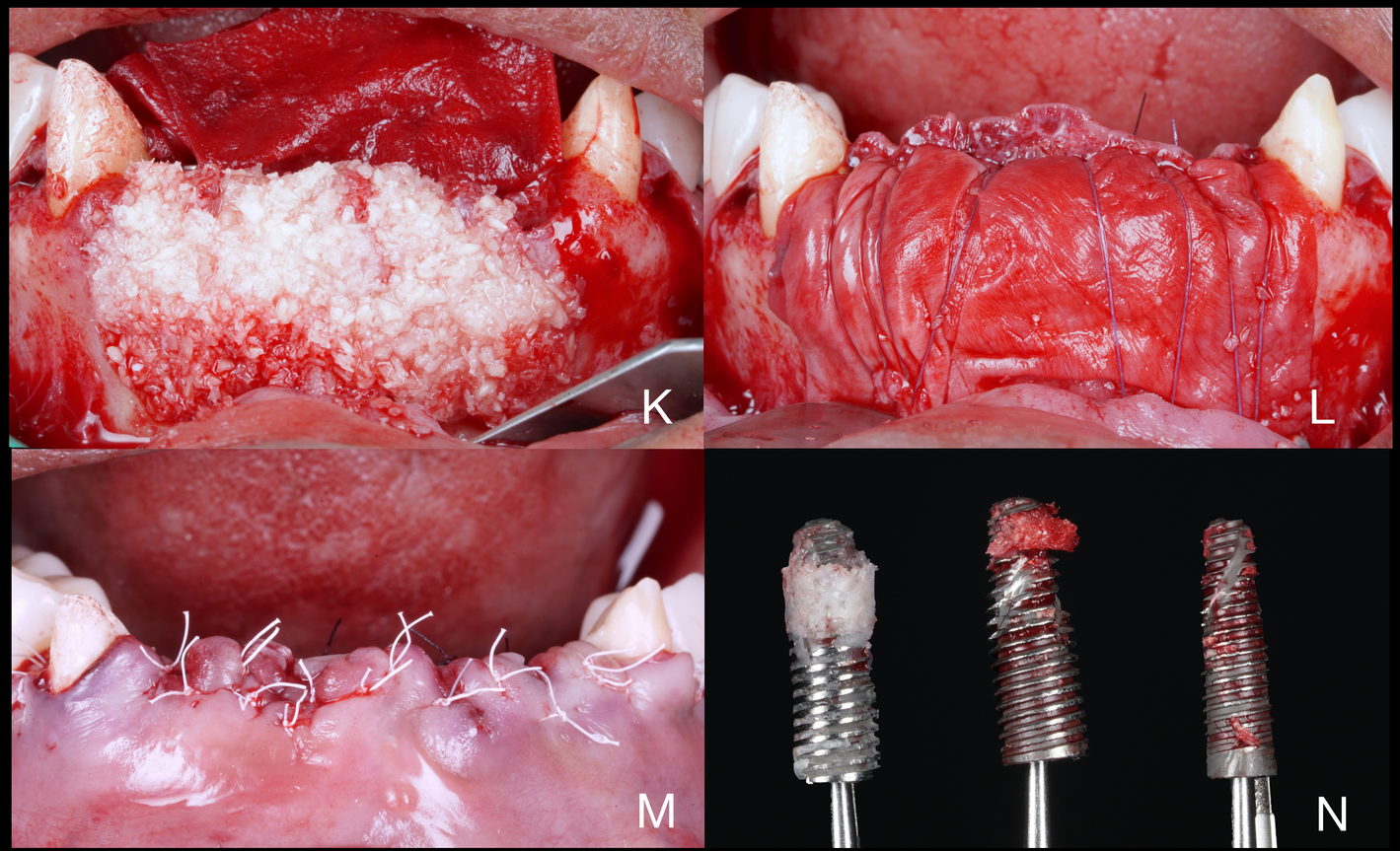
METHOD

The supracrestal hypoechoic area corresponding to the lesion was delimited and measured in the region of interest.[4] HFUS color doppler mode was used to assess blood flow through color power and color velocity.[2] The resulting HFUS images unveil highly inflamed areas, increased tissue perfusion, and extensive peri-implant lesions involving more than 90% of buccal bone loss in 3 out of 4 implants.

High Frequency Ultrasound Diagnosis Of An Advanced Peri-Implantitis Case In The Esthetic Zone

Praewvanit Asavanamuang, DDS[1], Piyarat Sirirattanagool, DDS[1],
Ekaterini Antonellou, DDS, DMD, MSc, FACP[1], Maria Elisa Galarraga-Vinueza, DDS, MSc, PhD[1]

[1]Department of Prosthodontics, Tufts University School of Dental Medicine, Boston, USA



METHOD

Over implant removal surgery, the dimensions of granulation tissue surrounding #8, 9 and 10 implants were identical to those previously observed on ultrasonography imaging. The implants and granulation tissues were removed. Guided bone regeneration was performed with a mixture of autogenous bone, allograft and xenograft. A tenting screw was positioned and periosteal stabilizing sutures were used to secure resorbable collagen membranes. Primary flap closure was achieved. Six months follow-up revealed no signs of local inflammation and normal soft tissue healing. Patient received a fixed polymethyl methacrylate provisional bridge.

K) Bone augmentation with collagen membrane L) Periosteal vertical mattress sutures M) Primary flap closure N) Removed implants

High Frequency Ultrasound Diagnosis Of An Advanced Peri-Implantitis Case In The Esthetic Zone

Praewvanit Asavanamuang, DDS[1], Piyarat Sirirattanagool, DDS[1],
Ekaterini Antonellou, DDS, DMD, MSc, FACP[1], Maria Elisa Galarraga-Vinueza, DDS, MSc, PhD[1]

[1]Department of Prosthodontics, Tufts University School of Dental Medicine, Boston, USA

CONCLUSION

HFUS provided accurate real-time, non-invasive diagnostic capability that is beneficial for proper peri-implant disease diagnosis, treatment planning, and evaluation of treatment outcomes. Future studies with ultrasonography may offer quantifiable values for cutoff point diagnosis of peri-implant diseases. This would overcome any subjectivity from applications of periodontal probes and 2-D radiographs for detection of clinical inflammation and peri-implant disease severity.



O,P) Soft tissue at 6 months follow up, Q) Peri-apical radiographs at 6 months follow up, R) Milled polymethyl methacrylate provisional bridge

REFERENCES

1.Schwarz, Frank, et al. "Peri-implantitis." Journal of Clinical Periodontology (2018): 246-266.

2. Barootchi, S., et al. "Ultrasonographic Tissue Perfusion in Peri-implant Health and Disease." Journal of Dental Research (2022): 278-285.

3. Bohner, Lauren, et al. "Assessment of buccal bone surrounding dental implants using a high-frequency ultrasound scanner." Ultrasound in Medicine & Biology (2019): 1427-1434.

4. Bohner, Lauren, et al.. "Accuracy of high-frequency ultrasound scanner in detecting peri-implant bone defects." Ultrasound in Medicine & Biology (2018): 1-10.

5. Chan, Hsun-Liang, et al. "Ultrasonography for noninvasive and real-time evaluation of peri-implant tissue dimensions." Journal of Clinical Periodontology (2018): 1-10.