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Case Report

Treatment of aggressive periodontitis with photodynamic therapy and ozonated water irrigation as an adjunct to scaling and root planing: A case report

Sheikh Aziz Ikbal[1], Zeba Rahman Siddiqui[1], Roopanshi Mehrotra[1], Sapna Ahlawat[1]

[1]Department of Periodontology, Career Postgraduate Institute of Dental Sciences and Hospital, Lucknow, Uttar Pradesh, India.

***Corresponding author:**
Zeba Rahman Siddiqui, Reader, Department of Periodontology, Career Postgraduate Institute of Dental Sciences and Hospital, Lucknow, Uttar Pradesh, India.

skaziz.ikbal13@gmail.com

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ABSTRACT

Aggressive periodontitis (AgP) is a type of periodontitis which causes rapid destruction of periodontal ligament and alveolar bone and occurs in otherwise systemically healthy individuals generally of a younger age group, but patients may be older. Ozonated water strongly inhibits the formation of oral biofilm and reduces the number of subgingival microbes. The photodynamic therapy (PDT) leads to formation of highly reactive nacent oxygen which causes bacterial cell death. This case report compares the treatment outcome of AgP with antimicrobial photodynamic therapy and ozonized water. The right side of a AgP diagnosed patient was treated by scaling and root planing (SRP) followed by subgingival irrigation with ozone water, while the left side was treated with SRP followed by PDT. After four sessions of irrigation, higher pocket reduction, more clinical attachment gain, and lower bacterial load were found in the segment treated with PDT.

Keywords: Aggressive periodontitis, Photodynamic therapy, Ozonized water, Microbiological Culture

INTRODUCTION

Periodontal disease is a group of inflammatory disorders, the pathophysiology of which is related to tooth accumulated microbial plaque and also the host response to those accumulations (Miller *et al*., 1984).[1] Aggressive periodontitis (AgP) is a type of periodontitis which causes rapid destruction of periodontal ligament and alveolar bone and occurs in otherwise systemically healthy individuals generally of a younger age group, but patients may be older.[2] It is a complex disease, wherever there is interaction of genetic, immunologic, microbiologic, and behavioral/environmental risk factors decides the onset, course, and severity.[3] Several studies have been identified the microbiological background of AgP which includes species such as *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis*, *Capnocytophaga* species, *Eikenella corrodens*, *Prevotella intermedia*, and *Campylobacter rectus*.[4]

Several studies have put forward various treatments including surgical and non-surgical debridement, disinfectants, and antibiotics for the treatment of AgP.[5] The initial therapy of AgP aims to eliminate the bacterial load of periodontal pockets.[6] Recently to reduce, the bacterial load scaling and root planing (SRP) followed by antimicrobial photodynamic therapy (aPDT) or irrigation with ozonized water has been proposed.

In the following case, a comparison between treatment of AgP with antimicrobial photodynamic therapy and ozonized water was done.

CASE REPORT

A systemically healthy 19-year-old female patient reported to department of Periodontology at Career Post Graduate Institute of Dental Sciences and Hospital, Lucknow with the chief complaint of sensitivity to hot and cold and bleeding from gums since 2–3 years. No contributory medical history was reported by the patient. The patient gave history of losing teeth at an early age of 13 years and her siblings had similar symptoms.

On intraoral examination, all teeth were present except 18, 28, 38, 48, 36, and 46 (root stump). Grade I mobility was present in 31 and 41. Proximal contacts were lost between maxillary and mandibular anterior teeth. The gingiva was reddish pink in color with rolled out margin, soft, and edematous in consistency and stippling was absent. Generalized bleeding on probing was present [Figure 1].

On periodontal examination, the pocket probing depth ranged from 4 mm to 7 mm (maximum in 16 and 41) while clinical attachment.

Investigations

Routine blood investigations, such as complete blood count, bleeding time, and clotting time, were in the normal range.

Orthopantomogram revealed periodontal bone loss in maxillary and mandibular anterior and molar regions [Figure 2].

Figure 1: Facial view.

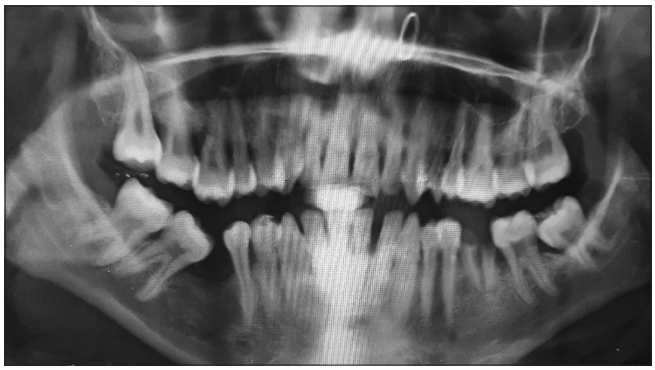

Figure 2: Orthopantomogram.

Microbiology

Plaque samples were taken with the help of sterile curette from the maximum pocket depth area at baseline and at the end of the treatment (1 month period) and were placed on blood agar plates. The samples were incubated aerobically at 37°C for 48 h. At baseline, microbiologic analysis showed 10^6 colony forming units in all four quadrants [Figure 3].

Treatment

Written informed consent was taken from the patient before starting the treatment.

Right side (first and fourth quadrant)

The right side is treated by SRP followed by subgingival irrigation with ozone water. Irrigation of the pockets was done using a sterile syringe with 150 ml of ozonized water over 5–10 min once weekly, for 1 month [Figure 4]. The ozonated

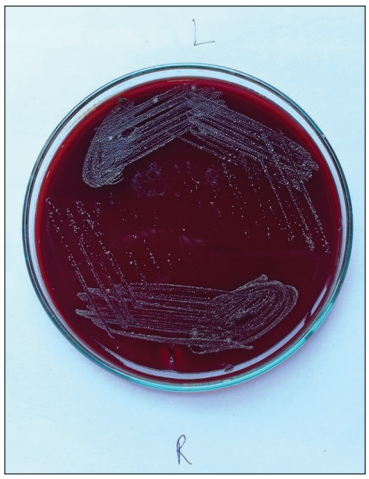

Figure 3: Microbiologic analysis at baseline (R: Right and L: Left).

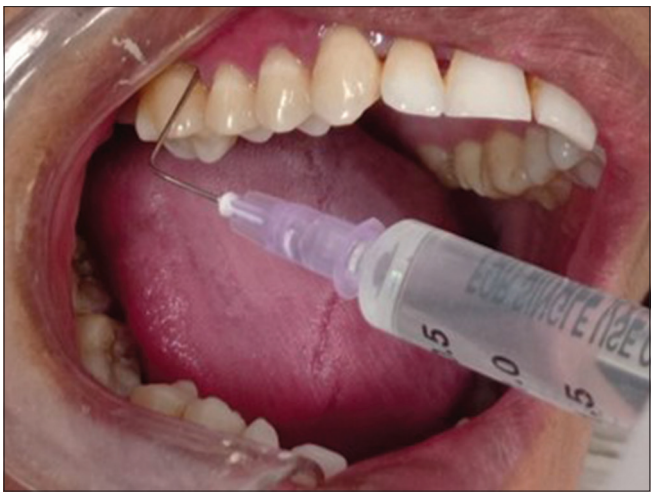

Figure 4: Ozonated water irrigation.

water was freshly prepared from commercially available ozone device (*Farday Ozone*) that releases ozone in sterile water. The concentration of ozone was 0.5 to 4 mg per treatment which has positive rather than destructive effect.[7]

Left side (second and third quadrant)

The left side was treated by SRP followed by subgingival irrigation with photodymanic therapy. The photosensitizer, indocyanine green (*Aurogreen*) of 0.05 mg/ml in concentration, was applied from the bottom of periodontal pockets in a coronal direction. The diode soft laser light (doctor smile®) with a wavelength of 670 nm and a maximum power of 0.5W for 1 min in non-contact continuous wave mode was used subgingivally.[8] After 1 min, pockets were rinsed with water. This was done once weekly for 4 weeks [Figures 5 and 6].

Oral hygiene instructions were given and no medications were prescribed.

Result after 4 weeks

Right side (first and fourth quadrant)

The color of gingiva was pink except 41, 42 region, where it was reddish pink. The consistency was firm. The pocket probing depth ranged from 1 mm to 3 mm (pocket reduction of 4 mm was seen in 16) and clinical attachment level ranged from 1 mm to 6 mm (gain in clinical attachment level of 5 mm was seen in 41) [Figure 7].

Figure 5: Photosensitizer irrigation.

Figure 6: Application of laser.

The microbiological analysis showed 10^4 colony forming units in this region [Figure 8].

Left side (second and third quadrant)

The color of gingiva was pink except 31 regions where it was reddish pink. The consistency was firm. The pocket probing depth ranged from 1 mm to 2 mm (pocket reduction of 5 mm was seen in 27) and clinical attachment level ranged from 1 mm to 8 mm (gain in clinical attachment level of 6 mm was seen in 31) [Figure 7].

The microbiological analysis showed 10^3 colony forming units in this region [Figure 8].

DISCUSSION

Gingivitis and periodontitis are characterized by a local lack of oxygen of tissues and also by various oral microflora.[9] The

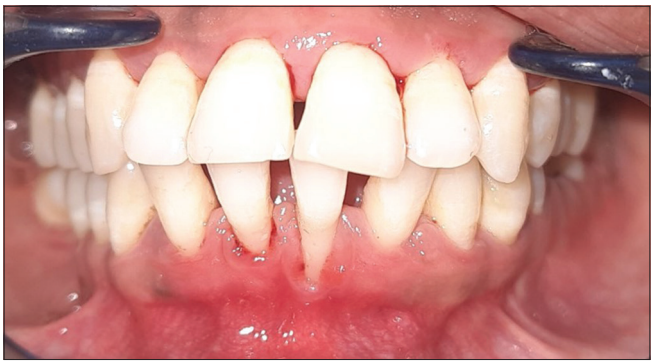

Figure 7: Facial view after 4 weeks.

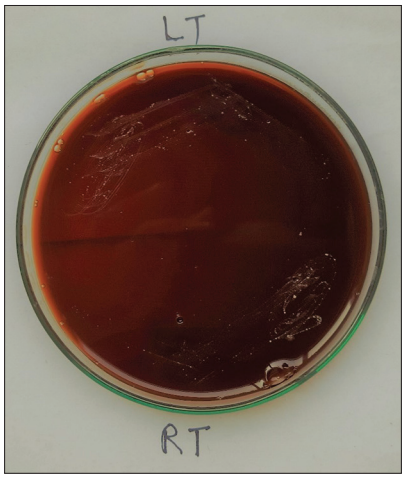

Figure 8: Microbiologic analysis after 4 weeks (LT: Left side treated with photodynamic therapy and RT: Right side treated with ozone therapy).

presence of microbial plaque in the gingival crevice area in an escalated amount changes the oral environment, leading to both gingivitis and periodontitis. It has been proved that certain bacterial types exist in the periodontal pockets of AgP patients, which is associated with active lesions.[10] The objective of this case report was to compare the efficacy of photodynamic therapy and ozonized water in AgP.

Ozonated water strongly inhibits the formation of oral biofilm and reduces the number of subgingival microbes. The antimicrobial effect of ozone is a due to its action on bacterial cells by damaging its cytoplasmic membrane due to ozonolysis of double bonds and also by modification of intracellular contents due to secondary oxidants effects.[11]

The mechanism of action of aPDT involves the excitation of photosensitizer dye molecules by laser light or visible light of specific wavelength. The photosensitizer reacts with endogenic oxygen, leading to the formation of highly reactive nacent oxygen. These reactive oxygen species are highly cytotoxic which causes bacterial cell death.[12]

Most of the studies have used either ozonated water or used photodynamic therapy as treatment for AgP, but we have compared the efficacy of subgingival irrigation by ozonated water and photodynamic therapy. Ramzy *et al*. used ozonated water and investigated antimicrobial effect of ozone and reported significant improvement in clinical parameters.[9] Moreira *et al*. used SRP combined with aPDT which showed significant reduction in bacterial load.[8]

Most of the pocket reduction therapies require surgical intervention, but in this present case, the pocket reduction was achieved by subgingival irrigation and it is non-invasive procedure acceptable to most patients. In this case, both photodynamic therapy and ozonated water showed bacterial load reduction and improvement in clinical parameters such as pocket probing depth and clinical attachment level. However, photodynamic therapy showed more bacterial load reduction than the ozonized water irrigation.

It is recommended that multicenter clinical trials with large number of samples comparing the effect of aPDT (as an adjunct to SRP) and ozone water irrigation (as an adjunct to SRP) in the management of AgP should be conducted to rationalize the use of aPDT in the management of AgP.

CONCLUSION

The application of four sittings of aPDT and ozone water irrigation, adjunctive to SRP, promotes additional clinical and microbiological benefits in the treatment of deep periodontal pockets in patient with AgP. Furthermore, aPDT shows more clinical and microbiological benefits than ozonated water irrigation.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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