Antimicrobial Photodynamic Therapy as an alternative to Systemic Antibiotics: Results from a Double-Blind, Randomized, Placebo-Controlled, Clinical Study on type 2 Diabetics.

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This double-blind, placebo-controlled clinical study compared multiple applications of the Antimicrobial Photodynamic Therapy (aPDT) treatment protocol, to systemic doxycycline as adjuvant to scaling and root planning (SRP) on type 2 diabetic patients on clinical, systemic and immune-inflammatory outcomes.

Thirty two patients were considered elegible for the study purpose. Two patients declined to participate and were excluded from randomization (figure 1). Demographic data can be seen on table 1.

Groups	Age	Female	Male
SRP+aPDT	48.9 ±9.5	8	7
SRP+Doxy	49.3 ± 7.4	8	7

Table 1. Demographic data

Study design

Both groups received scalling and root planing (SRP) within 48 hours. Systemic antibiotic group (SA) received 15 capsules of Doxycycline 100mg (2 capsules 1 hour before SRP, and 1 capsule/day for 13 days) and a sham procedure for antimicrobial photodynamic therapy. Antimicrobial photodynamic therapy group (aPDT) procedure included irrigation with saline after SRP, gentle application of phenotiazinium chloride 10mg/mL (Helbo Blue®, Bredent Medical GmbH & Co, Germany), a pre irradiation time o 5 minutes, followed by irrigation with saline and irradiation with 670nm (HELBO® *TheraLite Laser,* Bredent Medical GmbH & Co, Germany) for 10 seconds each site (70 mW of power, and a power density of 28mW/cm²), with an optic fiber angulated 60º, 0.06mm diameter, 8mm length, delivering a total energy of 2.79J/cm² per site (16.72 J/cm² per tooth). This aplication was repeated at 2, 7 and 14 days post SRP.

Results

Both therapies successfully reduced periodontal parameters (Table 2) and no statistical difference could be achieved on inter-group analysis. Numerical, but not statistically significant difference could be noted on ΔHbA1c.

Desirable clinical outcome was considered when a site end up the experimental time with probing pocket depth (PPD) < 4mm. When this data was analyzed (Table 3), there were significant difference favouring aPDT, in unirradicular teeth with moderate pockets.

The cytokine profile can be seen on figure 2. There was only statically significant difference in IL-1β, favouring aPDT, at 3 months post SRP.

Discussion and Conclusions

Despite the lack of statistical difference between them, both therapies successfully reduced initial periodontal parameters. The use of aPDT can be a feasible substitute to systemic antibiotics in treatment of periodontal treatment in type 2 uncontrolled diabetic patients. In addition, the aPDT seem to reduce surgical, or additional therapy necessity on aesthetic areas (unirradicular teeth). Both treatment significantly reduced HbA1c levels. APDT shown nearly clinical significant reductions (9,9% of initial levels).

Substitution of commonly used systemic antibiotics maybe an important strategy to overcome the treat caused by antimicrobial resistance. More clinical study to confirm the best protocol to be used.

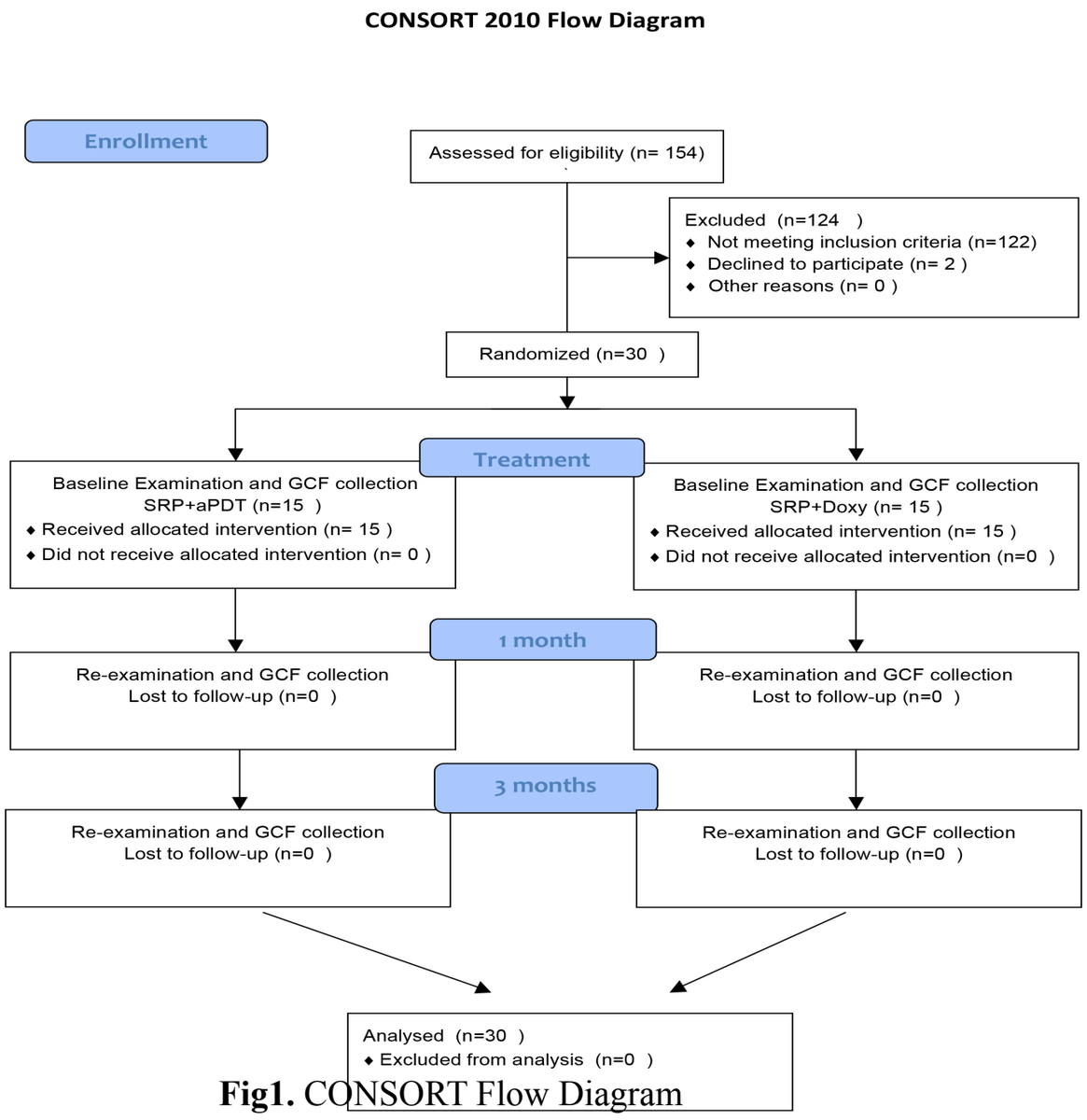

Fig1. CONSORT Flow Diagram

	SRP+Doxy			SRP+aPDT		
	Baseline	3 months	p value	baseline	3 months	p value
PPD (mm)	4.86 ± 1.39	2.88 ± 0.45	p<0.05	4.89±0.68	3.47±0.58	p<0.05
REC (mm)	1,04 ± 0,72	1,21 ± 0,64	NS	0,72 ± 0,50	1,36 ± 0,82	
CAL (mm)	5,53 ± 0,86	3,87 ± 0,52	p<0.05	5,60 ± 0,68	3,90 ± 0,52	p<0.05
BoP (%)	23.53 ± 9,33	13.47 ± 4,62	NS	28.13 ± 7,79	11.50 ± 5,41	p<0.05
HbA1c (%)	9,69 ± 1,68	8,93 ± 1,37	p<0.02	10,6 ± 1,99	9,61 ± 1,56	p<0.02
ΔHbA1c (%)	-	0,76 ± 0,73		-	0,99 ±1,00	NS
ΔCAL (mm)		1,66 ± 0,90			1,69 ± 0,94	NS
ΔPPD (mm)		2,04 ± 0,77			1,96 ± 0,88	NS

Table 2. Clinical parameters: mean PPD, CAL, REC, BoP, HbA1c, and ΔCAL, ΔPPD, ΔHbA1c (in proportion), at the experimental times

	SRP+ Doxy	SRP+aPDT	p value
Unirradicular			
4mm			
3 months	75.13 ± 25.23	81.20 ± 17.52	NS
5 to 6mm			
3 months	47.53 ± 27.40	78.38 ± 27.03	p<0.01
≥ 7mm			
3 months	14.50 ± 17.40	35.90 ± 33.16	NS
Multirradicular			
4mm			
3 months	72.98 ± 21.61	84.75 ± 25.12	NS
5 to 6mm			
3 months	59.69 ± 31.20	74.38 ± 28.45	NS
≥ 7mm			
3 months	64.29 ± 35.71	49.29 ± 37.01	NS

Table 3 Desired Clinical Endpoint (%) on different experimental times. There were only included site with initial PPD> 3mm.

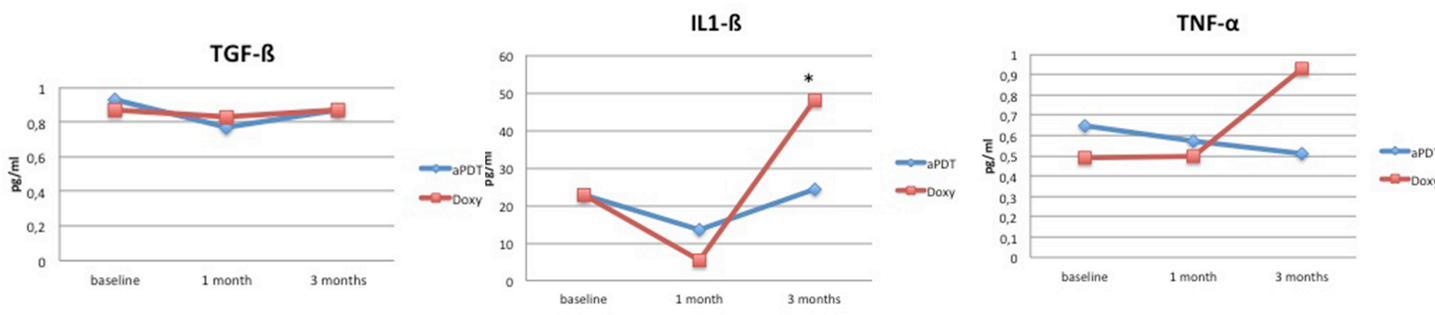

Figure 2. Cytokine levels. *= p < 0.05.

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