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ORIGINAL ARTICLE

Assessment of clinical efficacy of locally delivered 0.2% Thymoquinone gel in the treatment of periodontitis

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KEYWORDS

Alkaline phosphatase;
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Probing pocket depth;
Relative attachment level;
Thymoquinone

Abstract *Objectives:* To evaluate the potential benefits of local application of Thymoquinone gel as an adjunctive to scaling and root planing (SRP) in subjects with chronic periodontitis.

Material and methods: Twenty subjects with 40 test sites were selected according to inclusion and exclusion criteria. They were further divided into 2 groups. Group I comprised of study subjects (Thymoquinone in addition to SRP) and Group II comprised of control subjects (only SRP). Clinical parameters such as Plaque Index (PI), Gingival Index (GI), Probing Pocket Depth (PPD), Relative Attachment Level (RAL), were monitored at baseline and 6 weeks post operatively. Alkaline phosphatase (ALP) levels in gingival crevicular fluid (GCF) were evaluated at baseline and 6 weeks post operatively using microcapillaries. In addition antimicrobial efficacy of Thymoquinone was evaluated against 3 bacteria using antimicrobial strains.

Results: Statistically highly significant reduction was observed in PI, GI and PPD, rise in RAL and GCF ALP level in both the groups at 6 weeks from baseline. On comparison between Group I and Group II, former demonstrated statistically significant reduction in PPD, GCF-ALP levels and rise in RAL but statistically no significant differences were observed in PI and GI at 6 weeks. On microbiological assessment of 0.2% Thymoquinone gel, it was observed to be sensitive against *P. gingivalis*, *A. actinomycetemcomitans and P. intermedia*.

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Conclusion: Significant changes in clinical and biochemical parameters were achieved in the current study. Hence, it is concluded that intracrevicular application of 0.2% Thymoquinone gel could be a beneficial adjunct to SRP in treating chronic periodontitis.

1. Introduction

Periodontitis is an inflammatory and destructive, pathological condition that affects the connective tissue attachment of the teeth affecting mostly the adult population of the world. It is characterized by elevated host response against the associated gram-negative pathogens usually organized as a biofilm, destroying cells and supporting tissues, which ultimately causing tooth loss (Breivik et al., 2006; Brotto et al., 2011; Duang et al., 2011). It has been proved that an increase in oxidative stress and diminished antioxidant capacity are major factors responsible for destruction of periodontal structure (AbouSulaiman and Shehadeh, 2010). Patients pertaining to periodontitis demonstrate an oxidative stress in the oral cavity (D'Aiuto et al., 2010).

Oxidative stress results from imbalance between generation of free radicals and antioxidants, regulating the oxidative reactions by inhibiting/delaying/hampering the oxidation of substances. The 'imbalance' resulting in oxidative stress can be hampered by increased free radicals, or by reduction in the amount of anti-oxidative substances, further causing lipid peroxidation; injured DNA; or degradation of cellular proteins. Additionally oxidative stress has been related to a number of chronic inflammatory diseases (AbouSulaiman and Shehadeh, 2010).

With emerging awareness concerning the role of oxidative stress associated with periodontal disease, host-modulator therapies are being investigated which regulate the role of antioxidants in preventing the breakdown of soft and hard periodontal tissues (Toker et al., 2008; Toker et al., 2009; Tomofuji et al., 2009). Taking into consideration their anti-oxidative and anti-inflammatory properties, herbal therapy is also a special area of research for the prevention and treatment of various periodontal diseases. Nigella sativa is a widely used plant in traditional medicines particularly in Middle-Eastern and Asian countries for treatment of wide range of ailments, most commonly including rheumatoid pain, hypertension and asthma (Chehl et al., 2009).

Recently, it has been observed that most of the properties of Nigella sativa or its extracts are attributed to Thymoquinone (2-isopropyl-5-methyl-1, 4-benzoquinone), which is one of the monoterpenoid hydrocarbon compounds of Nigella sativa's volatile oil (Sultan et al., 2009) having anti-oxidant (Chaieb et al., 2011; Iauk et al., 2003; Mansour et al., 2001; Sultan et al., 2009; Vahabi et al., 2011) and anti-inflammatory properties (Chehl et al., 2009; El-Dakhakhny et al., 2006; Tekeoglu et al., 2007).

Considering the above merits, the present study was undertaken with an aim to access and compare the efficacy of locally delivered 0.2% Thymoquinone gel in the treatment of chronic periodontitis on the basis of various clinical and biochemical parameters.

2. Materials and methods

2.1. Study population

The present study was carried out in the Department of Periodontology and Oral Implantology, as per the Declaration of Helsinki *(1964 revised in 2008)*, with the approval of Institutional Ethical Committee of the University, which included a total of 40 sites from 20 patients aged between 23–61 years (mean age 36.25 years, 15 males and 5 females) (Antczak-Bouckoms et al., 1990; Ramfjord et al., 1968).

The subjects were selected from the outpatient department and were divided into 2 groups. Group I served as study groups comprising of subjects in which 0.2% Thymoquinone was administered in addition to scaling and root planing, and Group II served as control group comprising of subjects in which only scaling and root planing (SRP) was done. All the participants were given detailed verbal and written description of risks and benefits of the treatment and a written consent was subsequently obtained.

2.2. Selection criteria

Both male and female subjects with at least 2 sites of periodontal pocket one in each quadrant of maxillary teeth, having a probing depth of $\geq$5 mm with radiographic evidence of bone loss were included in the study. The sites were chosen from maxillary teeth to avoid contamination with saliva (Sanikop et al., 2012).

Subjects were excluded from the study; if their systemic health precluded periodontal treatment; if they were pregnant; if they had any known allergy or hypersensitivity to any product used in the study; if they had previous periodontal and/or antibiotic therapy in the last 6 months.

2.3. Gingival crevicular fluid collection and alkaline phosphatase level estimation

The selected sites from maxillary teeth were isolated with the help of cotton rolls and were dried with a gentle stream of air. Gingival crevicular fluid (GCF) samples were collected with the help of calibrated microcapillary tubes (0–5 µl range) placed extracrevicularly at gingival margin and were held in the same position until 5 µl of the GCF was collected. The collected GCF was immediately transferred to a sterilized microcentrifuge (Eppendorff) tubes that contained 45 µl of normal saline. Then the samples were subjected to alkaline phosphatase (ALP) level estimation carried out at baseline and 6 weeks postoperatively.

ALP levels were determined by using a commercially available diagnostic kit (Erba Chemicals, Mallaustr, 69–73,

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