

HEALING AND REGENERATION OF TISSUES FOLLOWING PERIODONTAL TREATMENT IN MENOPAUSAL WOMEN

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ABSTRACT

Association of osteoporosis with the onset and progression of periodontal disease and declining estrogen level following onset of menopause has been linked to alveolar bone leading to tooth loss.

Guided tissue regeneration has been accepted as evidence of periodontal regeneration in the evaluation of GTR procedures by resorbable membranes of bio-compatible nature, such as bovine or human collagen membrane in this study, the use of freeze dried, cross linked bovine collagen was evaluated in the guided tissue regeneration method of periodontal treatment in menopausal patients along with maintaining nutritional balance (Calcium 1g / day with vitamin D 700 iu / day) to assess and to control / reduce the bone loss in periodontitis.

Clinical Measurements like PPD, PAL, PI, BI, bitewing radiographs and heel sonometry at baseline, 6 and 9 months were taken. Significant improvement was recorded in test groups as compared with control groups. Further research / trial is necessary using other alternate bio-compatible natural cost effective materials.

Key words: Periodontitis, menopause, Osteoporosis, bovine collagen, guided tissue regeneration

INTRODUCTION

Osteoporosis and periodontal disease increase with age.^{5,6} Periodontitis has been defined as an infection mediated destruction of the alveolar bone and soft tissue attachment to the tooth, responsible for most tooth loss in populations.^{1,2}

Systemic loss of bone density in osteoporosis, including that of jaw bones also provides a host system, with increasing susceptibility to infectious destruction of periodontal tissue.^{3,4,5} Current evidence including several prospective studies support the association of osteoporosis with the onset and progression of periodontal disease in humans.^{6,7} Potential mechanisms by which host factors may influence the onset and pro-gression of periodontal disease directly or indirectly include underlying low bone density in oral cavity.

The declining estrogen levels following the onset of menopause have also been linked to a greater risk of tooth loss.⁸ Bone loss in women occurs most rapidly in the years immediately following menopause, when natural levels of estrogen decline. Estrogen deficiency conditions have been associated with elevation in gingival inflammation.^{32,33} The decline in natural levels of estrogen, deficient intake of calcium and

vitamin D and neglected oral hygiene leads to advanced periodontitis. A woman begins to lose bone density at the rate of approximately 1% per year after menopause. Bone loss affects the following in descending order: jaw bone, cranial bones, ribs, vertebrae and long bones.^{35,36,37,38,39}

The effect of adequate calcium intake and hormone replacement therapy has formed the basis of several recent studies and also demonstrated that increased calcium/ vitamin D intake and conventional periodontal treatment improves the inflammatory process and tooth mobility in osteoporotic patients suffering from periodontitis.^{11,12}

In the last decades, Guided Tissue Regeneration techniques (GTR) have been applied in treating various periodontal defects such as infrabony defects, furcation involvement and localized gingival recession defects and it has been suggested that clinical signs of probing attachment gain and bone fill can be accepted as evidence of periodontal regeneration in the evaluation of GTR procedures.^{13,14,15,16}

In the recent years, natural or synthetic bio-absorbable barrier material for GTR have been introduced in order to avoid a second surgery, as for non absorbable membrane removal.^{17,18}

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Barrier materials of collagen origin from different species and from different anatomical sites have been tested in animals and in humans.^{19, 20, 21,22,23,24}

The role of bovine collagen sponge as a barrier in Guided Tissue Generation technique has been assessed clinically¹³ and the improvement in periodontal pocket depths was observed, but the evidence of improvement in bony defects or bone regeneration was not identified due to limitation of the study project.

The occurrence of the periodontal bone loss in majority of female population of menopausal age demands the new dimension and concepts applying periodontal treatment modalities including guided tissue regeneration technique and their comparative study to assess and to reduce the bone loss in periodontal disease in the same population.

METHODOLOGY

Split mouth analytical study was done. In this prospective interventional single blind clinical study each subject received greater than or equal to 2 treatments, each to a separate quadrant of jaws of patient. The study was carried out at Dental Department, Federal Government Hospital, PGMI, Islamabad. Duration of the study was 9 months. Ethical clearance was obtained from Ethical committee of SZPGMI, Lahore.

Each quadrant of jaw was considered one sampling unit. Therefore the sample size was 100 posterior quadrants with advanced periodontal disease.

The subjects were selected from amongst those, visiting the department of Dentistry and the department of Gynecology, FGPC PGMI and Pakistan Institute of Medical Sciences, Islamabad.

Female menopausal patients of age 50-60 years, suffering from chronic periodontitis affecting the jaw bilaterally, confirmed radiologically by using parallel X-ray technique, with Probing pocket depth ≥ 4 mm and ≤ 6.5 mm and also suffering from osteoporosis (confirmed with heel scan with a T score $>$ and subjects free from systemic diseases – like Diabetes, Collagen disorders, Hypoparathyroidism, Osteomalacia, rickets, renal osteodystrophy, sarcoidosis, malignant diseases, cardiovascular diseases, cardiac prosthesis, organ graft and necrotizing periodontal diseases formed the inclusion criteria.

Following were excluded from the study; Those receiving systemic medications with periodontal side effects e.g tetracycline, phenytoin, Alprazolam, Enalapril (antihypertensive) calcium channel blocker, immunosuppressives or those who have had hysterectomy or ferectomy or were on hormone replacement therapy (HRT). Moreover smokers, and subjects where tooth mobility was more than grade 1 or were known to exhibit side effects to calcium carbonate, and chlorhexidine were also excluded.

For the selected subjects, an evaluation chart was developed with measurements of the clinical param-

eters PPD, CAL, BI, PI, Tooth mobility, furcation involvement.

Patients underwent full mouth scaling, root planing and followed strict oral hygiene instructions, and also with 0.2 % chlorhexidine gluconate mouth rinses regularly.

Calcium (1g / day) with vitamin D (700 iu/day) for 10 months was also prescribed, one month before the surgery.

The subjects underwent for guided tissue regeneration technique with Bovine Collagen grafting under local anesthesia. On teeth in posterior quadrant, with severe periodontal defects (deeper periodontal pockets), as experimental site and the opposite quadrant acted as a control, where only mucoperiosteal flap surgery with open debridement was performed. Stitches were given with Vicryl (absorbable, braided polygalactin) and perio-pack (COEPACK) was applied.

The tissue healing and regeneration was assessed and compared at 0, 6 and 9 months time points during study period, between control and experimental sites. During the study, the time points selected, for the assessment, comparison and evaluation of the study parameters were;

Before starting the periodontal treatment

6th month, post treatment

9th month, post treatment

These time points have been selected because bony regeneration, if any, starts to show radiologically after 5 months post operatively and at 9 months, the healing process should be completed.

All the subjects were recalled every month (1st Saturday of every month) postoperatively for overall assessment of oral hygiene. Examiners variability for the recording of the probing pocket depth and probing attachment was also considered.

The readings and the measurements taken at specified time points during the study period were recorded and the validity of the results were assessed by statistical analysis.

The Kruskal Wallis test and paired t-test were applied for any statistical significance. After 10 days on the postoperative visit the collagen sponge couldn't be seen in the wound area.

RESULTS

The probing pocket depths of 50 patients were measured, who formed the study group and the change in PPD was compared in test and control sites from 0-9 months. A highly significant difference ($t = 6.46$, $p < 0.001$) was seen and greater reduction was seen at the test sites.

The second parameter that was measured was probing attachment level. The gain in PAL was compared in both test and control sites at 9 months by

paired t test and found a significantly greater gain ($t = 3.42$, $P < 0.01$) in PAL in test group as compared to the control group.

The next clinical parameter that was measured was bleeding indices (BI).

BI were analyzed and compared statistically between test and control sites at 0 time point and 9 months and a significant difference ($t = 5.15$, $p < 0.01$) was seen between test and control sites at 9 months.

BI was followed by Plaque Index (PI). The plaque indices in test and control sites were analyzed and compared statistically. No significant difference ($t = 3.27$, $p > 0.05$) was seen between test and control groups at 0 and 9 months time points ($t = 3.35$, $P > 0.05$). The furcation involvement test and control sites were analyzed and compared and a significant difference ($t = 5.45$, $P < 0.001$) was seen at 9 months time point.

Radiological assessment was one of the most important clinical parameters in this study as it provided information on improvement in alveolar height bony defects and trabeculation was noticed after 9 months. Bite wing, OPG, occlusal and Periapical radiographs were taken for the radiological assessment.

Heel sonometry reliability is doubtful but due to socioeconomic status of patients this test for T-scoring was Relied and all of the patients showed significant improvement in their t scoring from % to + at the end of the study.

DISCUSSION

This study dealt with the possible role of freeze dried bovine collagen sponge in the menopausal, osteoporotic females in the treatment of advanced periodontal disease following the technique of "Guided Tissue Regeneration".

Present clinical study was initiated on the basis of potential benefits of the collagen barrier membrane placement of periodontal regenerative treatment^{27,28},²⁹ but in this specific group of suffering females no such trial was documented for regeneration of periodontal defects.³⁰

In this clinical trial bovine collagen sponge was placed in apron fashion covering the alveolar bony defects and exposed root surfaces surrounding the periodontal defects, extended 2-3mm along the cemento-enamel junction and after suturing it was visible along the gum margins and after 10 days it was not seen. Healing following surgery was normal.

No untoward reaction was noticed in any of the patients when collagen was applied to the wound region. It provides substrates for migration, proliferation and adhesion of fibroblasts and also act as topical haemostatic agent^{27,28} and allow the progenitor cells of the periodontium to grow and lead to healing of the bony defects without causing any humoral or cellular immune response.^{29,38}

The results of the present study revealed an improvement in the periodontal condition with de-

crease in pocket depths and gain in attachment levels as well as significant reduction in BI and PI along with radiological improvement in bony trabeculation and alveolar height.³⁰

Menopause, Osteoporosis and periodontal disease share several risk factors which might be intertwined.

The decreased bone mineral density of osteoporosis in menopausal females can lead to an altered trabecular pattern and more rapid alveolar bone resorption, thus predisposing to periodontal disease.^{31,32} On the other hand periodontal infections can increase the systemic release of inflammatory cytokine, which accelerate systemic bone resorption. Vitamin D and calcium deficiency has been associated with a cytokine profile that favors greater inflammation and its supplementation decreases circulating inflammatory markers, and might break the vicious circle of osteoporosis, periodontitis and further systemic bone resorption.^{33,34,35,36,37}

Analysis of the results reported in some of the studies^{25,26} provide important information regarding the predictability of GTR in infrabony defects and indicated that there is an added beneficial effect of placing barrier materials over intrabony defects in conjunction with surgery, but do not provide any evidence for use of guided tissue regeneration technique in periodontal treatment of menopausal women to get tissue regeneration.

In a series of several clinical trials, subjects receiving 1gm calcium supplement along with Vitamin D (700 iu) daily for 12 months, showed an increase in bone density in the mandible of approx 12.5%.^{40,41}

Low Vitamin D has been associated with bone loss, increased risk for certain cancers and other chronic diseases. The literature suggests that low level of vitamin D is associated with periodontal disease and that supplement of Vitamin D and calcium leads to better periodontal health^{42,43,44} though these supplementations are not the recognized way to treat periodontitis but can play positive role along with other dental treatment modalities (Bio-film control, Debridement, GTR) to be followed before it leads to severe periodontal defect resulting in mobility or tooth loss.

Identification of specific high risk group for either menopausal osteoporosis or periodontitis could enable the gynaecologist to prevent and treat systemic and alveolar bone loss prior to the occurrence of a fracture or tooth loss. Periodontist should utilize the dental status of menopausal women suffering from periodontitis for referral of early diagnosis of generalized osteopenia/osteoporosis and similarly routine gynaecological checkup for menopausal women with osteoporosis should include a dental checkup for the early diagnosis of alveolar ridge resorption.

Medical and nutritional colleagues can play a vital role in coordination with periodontist to diagnose, control and treat the systemic ailments as there is a

risk of misinterpretation by those clinicians who are less versed in periodontal and dental ailments. It is important for a clinician to recognize the effect of hormonal imbalance on the tissues in oral cavity as well as systemic and psychological changes.

Increased interaction among medical and dental professionals could achieve patient's optimal health. But it will not be possible unless the patients play their role as well, which include maintaining good oral hygiene, frequent dental checkups, regular intake of Calcium and Vitamin D along with monitoring of blood chemistry. The results of this study are encouraging to warrant a study of larger mashed series with random choice of treated sites for the collagen graft material, but the availability and high cost of the graft material is a big hindrance for such a large scale design study. So some cost effective bio-compatible material should be searched for the benefit of the deprived people of the society.

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