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Evaluation of the effect of 0.8% hyaluronic acid gel as coadjuvant to non-surgical periodontal therapy. Pilot study

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Abstract

Introduction: *Hyaluronic acid is a glycosaminoglycan with a high molecular weight, present in high concentrations in the gum tissue and involved in tissue-repairing processes. It has been used as an adjuvant in the process of tissue regeneration, osseointegration of implants, healing of traumatic injuries and maxillofacial surgery, for its anti-inflammatory, cicatrising and elasticising effect. The aim of this pilot study was to evaluate the anti-inflammatory effect of 0l.8% hyaluronic acid gel 0.8% as an adjunct to non-surgical periodontal therapy.*
Material and methods: *Longitudinal split-mouth pilot study over 3 months on 4 patients (> 18 years) with chronic moderate-advanced periodontitis. Hyaluronic acid was applied to the experimental side after each visit for scaling and root planing. The following parameters were reported: plaque index (PI), bleeding index (BI), probing depth (PD), level of clinical attachment (CAL), gum recession (GR) and smoking.*
Results: *Further reduction in PD and BI were observed on the experimental side ($p < 0.05$, along with a greater tendency to GR on the control side ($p > 0.05$).*
Conclusions: *Hyaluronic acid appears to be an effective product as a coadjuvant nonsurgical periodontal treatment, although further studies and larger sample sizes are required.*
Key words: *Hyaluronic acid. Periodontitis. Bleeding index. Periodontal pocket. Coadjuvant treatment.*

Introduction

Hyaluronic acid is a glycosaminoglycan with a high molecular weight. It forms part of the extracellular matrix of connective tissue, particularly in dental and periodontal tissues, and is involved in tissue cohesion and repair[1].

Its main physical property is its capacity to absorb up to 50 times its dry weight, making the matrix highly elastic and allowing the exchange of

gases and other small molecules, while acting as a barrier against the passage of macromolecules and foreign bodies[2-4].

Due to its unique physical-chemical properties and the non-immunogenicity[5] of hyaluronic acid in its purified form, it has interesting applications in the fields of dermatology, ophthalmology and orthopaedics and, more recently in plastic surgery and tissue repair[11-13]. No contraindications or toxic effects have been described, and clinical studies have shown good therapeutic results, with high patient acceptance and tolerance.

Due to its anti-inflammatory properties and its role in the healing of wounds, its use has been extended to the field of dentistry, where it is used for tissue repair after surgery and in patients with varying levels of gum diseases, particularly gingivitis.

To date, the following therapeutic applications have been described for hyaluronan (the soluble or physiological form of hyaluronic acid) in the field of dentistry[14-16].

- As a coadjuvant in tissue and wound repair processes.
- Orthopaedics and orthognatic surgery.
- Traumatic, degenerative or inflammatory articular pathology, in combination with other drugs.
- Oral and maxillofacial surgery.
- Coadjuvant in the placement of implants.

High levels of endogenous hyaluronic acid are found in the gum tissue, where it is involved in tissue repair[1] and in re-establishing tissue structure after inflammatory processes, such as gingivitis. Because of these properties, it is used as a coadjuvant in the treatment of gum diseases. It has proven useful as a topical treatment for gingivitis, with the advantage that its adhesive capacity maintains its topical effect on areas where it is applied.

The following therapeutic uses have been described for hyaluronan in the field of periodontics[17-21]:

- Advanced gum disease; hyaluronan stimulates the immune response, leading to improved progress.
- Improves healing during and after periodontal treatment.
- Favours healing of traumatic lesions, inflammations and ulcers.
- Coadjuvant in tissue regeneration.
- Stimulates tissue repair after surgery.
- Minimises gum recession after surgery.
- Lowers the bleeding index.

The scientific basis behind this pilot study was its reparative effects, based on tissue reorganisation and fibrogenic, anti-inflammatory and antiexudative action, in the hope that topical application would prove beneficial to periodontal patients.

The main aim of the study was to evaluate the anti-inflammatory action of topical use of hyaluronan in 0.8% bioadhesive gel, as a coadjuvant to

non-surgical therapy in patients with generalised gum disease in moderate to advanced phases.

Material and methods

Split-mouth pilot study, carried out over 3 months on 4 patients (> 18 years) with generalised chronic periodontitis in moderate-advanced phases by the International University of Catalunya (UIC) University Dentistry Clinic (CUO).

Patients having received periodontal or antibiotic treatment in the previous 6 months were excluded, as were those suffering from systemic diseases. Oral hygiene instructions (IHO) were standardised, based on the Bass technique, non-use of mouthwash and flossing. The study parameters were bleeding index (BI), plaque index (PI), probing depth (PD), insertion level (NI) and tobacco use.

All patients were informed of the characteristics of the study, both verbally and in writing, and signed the informed consent sheet. The confidentiality of the information and voluntary participation were ensured.

At the first visit (T0), a complete dental chart was drawn up and a dental x-ray was taken. Photographs were taken for the record and the bleeding index (BI) and plaque index (PI) were calculated.

Scaling and root planing was carried out using curettes, along with ultrasound scanning of the periodontal pockets, followed by intrasulcular lavage with saline solution (Figure 1) and application of 0.8% hyaluronic acid gel (Figs. 2 and 3) to the experimental side (assigned randomly, by tossing a coin). The procedure was repeated after 4, 8 and 12 weeks (T2, T3 and T4, respectively).

The data was analysed using Statgraphics Plus 5.0, applying ANOVA multi-factor analysis.

Results

The average decrease in probing depth observed between the initial visit (T0) and the end of treatment (T4) was 1.07 mm ± 0.1 mm on the experimental side and 0.55 mm ± 0.05 on the control side, this reduction being most obvious on distolingual sites and least obvious on midvestibular sites, on both the control side and on the experimental side. The maximum reduction in probing depth was of 1.83 mm ± 0.37 mm on the experimental side and of 0.9 mm ± 0.37 mm on the control side, and occurred between the first visit (T0) and the 4-week visit (T1), The results were statistically significant ($p < 0.05$) (Figs. 4-9).

Gum recession maintained constant for the whole time on the experimental side, and tended to increase on the control side, although the results were not statistically significant ($p > 0.05$).

There was significant reduction of bleeding on both the experimental side and the control side, of 22% and 12%, respectively. The decrease in B1 was greater on the experimental side in non-smokers than in smokers, with 19.84% and 1.26%, respectively ($p < 0.05$) (Fig. 10).

Discussion

Our results coincide with those obtained by Pistorius, *et al.*[18], who observed reductions of 22.6% and 39.2% after 3 and 7 days, respectively.
Jentsch, *et al.*[19] also observed a reduction in bleeding after 21 days of daily application of hyaluronic acid gel in a group of 15 patients with plaque-induced gingivitis, obtaining statistically significant differences with regard to the placebo group.
Xu, *et al.* [20] also observed a reduction in bleeding index and probing depth in a group of patients with chronic periodontitis, applying hyaluronic acid gel after non-surgical periodontal treatment.

Conclusions

Our results allow us to conclude that 0.8% hyaluronic acid gel is effective as a coadjuvant to non-surgical periodontal therapy in controlling the inflammatory process and short-term gum bleeding.
It would appear that application of 0.8% hyaluronic acid gel reduces the probing depth and tends to reduce gum recession after non-surgical periodontal treatment.
Our results support other research carried out in the field, although more studies and greater sample sizes would be necessary in order to obtain satisfactory conclusions.

Figures:

Figure 1.
Intrasulcular lavage with saline solution after scaling and root planing of the periodontal pockets.

Figure 2.
Presentation of the 0.8% hyaluronic acid gel.

Figure 3.
Intrasulcular application of 0.8% hyaluronic acid gel.

Figure 4.
Probing depth on mesiovestibular sites (PSmv) on experimental side (1) and control side (2) and over time on the experimental side.
(0 =pre-treatment, 1:4 weeks, 2: 8 weeks, 3: 12 weeks post-treatment.)
Means and 95.0 percent LSD intervals
Test Control Time

Figure 5.

Probing depth on midvestibular sites (PSmev) on experimental side (1) and control side (2) and over time on the experimental side.
(0 =pre-treatment, 1:4 weeks, 2: 8 weeks, 3: 12 weeks post-treatment.)
Means and 95.0 percent LSD intervals
Test Control Time

Figure 6.
Probing depth on distovestibular sites (PS dv) on experimental side (1) and control side (2) and over time on the experimental side.
(0 =pre-treatment, 1:4 weeks, 2: 8 weeks, 3: 12 weeks post-treatment.)
Means and 95.0 percent LSD intervals
Test Control Time

Figure 7.
Probing depth on mesiooral sites (PS ml) on experimental side (1) and control side (2) and over time on the experimental side.
(0 =pre-treatment, 1:4 weeks, 2: 8 weeks, 3: 12 weeks post-treatment.)
Means and 95.0 percent LSD intervals
Test Control Time

Figure 8.
Probing depth on midoral sites (PS mel) on experimental side (1) and control side (2) and over time on the experimental side.
(0 =pre-treatment, 1:4 weeks, 2: 8 weeks, 3: 12 weeks post-treatment.)
Means and 95.0 percent LSD intervals
Test Control Time

Figure 9.
Probing depth on distooral sites (PS dl) on experimental side (1) and control side (2) and over time on the experimental side.
(0 =pre-treatment, 1:4 weeks, 2: 8 weeks, 3: 12 weeks post-treatment.)
Means and 95.0 percent LSD intervals
Test Control Time

Figure 10.
Bleeding index (sang. Ioc) on experimental side (1) and control side (2) and over time on the experimental side.
(0 =pre-treatment, 1:4 weeks, 2: 8 weeks, 3: 12 weeks post-treatment.)
Means and 95.0 percent LSD intervals
Test Control Time

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