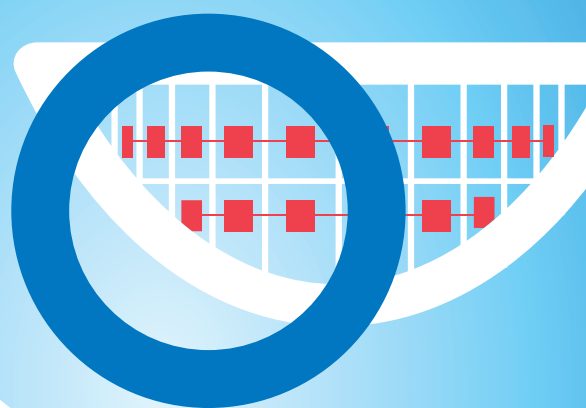


GENGIGEL[®]

Hyaluronic Acid

ORAL HEALTH
& BRACE ABRASIONS
FACT FILE



HOW CAN ORTHODONTIC APPLIANCES AFFECT ORAL HEALTH?

Orthodontic treatments have gained worldwide popularity both for functional and aesthetic benefits. Epidemiological data on oral conditions showed that [nearly half of the population \(48%\) suffered disability from oral health conditions leading to the necessity of restoring treatments](#) (Kassebaum, 2017). Over the past three decades, only [in North America the number of orthodontic patients has increased by 100%](#) where nearly 4 millions (80% of the total population considered) are juveniles aged between 6 and 18 years (Ren, 2014). In general, malocclusions are the main cause for the recurrence to fixed

48%
population
needs
restoring
treatments

4mln
juvenile
orthodontic
patients
(USA)

appliances. In many cases, single-tooth anterior crossbites result in stripping of the attached gingiva of lower incisors, with consequent severe impinging deep bites that may lead to destruction of the palatal soft tissues. Hence, orthodontic treatments are fundamental to correct these problems and blocking the progression of severe periodontal diseases. It seems reasonable that straighter teeth are easier to clean, and perhaps having all the teeth centered in the alveolar housing and occluding correctly may promote a healthier periodontium. Orthodontic treatment may improve periodontal health in these circumstances, but it also holds some potential for harm to the periodontal tissues (Bollen, 2008). [The primary etiology of gingivitis and periodontitis is a mixed bacterial infection](#) in complex biofilm structures on su-

pragingival and subgingival tooth surfaces and oral soft tissues. [Treatment with fixed orthodontic appliances causes changes in the normal oral environment. Biofilm formation around fixed orthodontic appliances can cause important side effects.](#) The introduction of fixed appliances into the oral cavity not only promotes the amount of biofilm formation but also increases the level of acidogenic bacteria inside the biofilm, resulting in a higher cariogenic challenge around orthodontic brackets and bands (Mei, 2017). In addition,

**biofilm
alteration**



after placement of bonded and banded orthodontic appliances, increased plaque accumulation, bleeding on probing, and probing pocket depth have been reported (Kim, 2010)

HOW DOES ORTHODONTIC APPLIANCES FAVOR THE ONSET OF PERIODONTITIS?

Orthodontic treatment are generally proposed during adolescence, in a period when the human body experiences many behavioral and hormonal changes (Vetter-O'Hagen, 2012). [In young subjects puberty itself is associated with increased gingivitis](#) and wearing orthodontics increase the probability to be subjected to periodontal complications (Mariotti, 2013).

[The main complications associated with orthodontic fixed appliances are gingivitis, periodontitis, gingival recession or hypertrophy and alveolar bone loss](#) (Cerroni, 2018). The presence of plaque is considered to be one of the main factors in the development of gingivitis (Meeran, 2013); the rough surface of the orthodontic appliance most likely cause an excessive quantitative amount of composite around the bracket which makes oral hygiene practices more difficult thus increasing plaque accumulation and gingival inflammation (Ristic, 2007). Furthermore, the design itself of orthodontic bands that consists

of many pieces of stainless steel that are soldered or welded together, and the material characteristics of orthodontic brackets can influence bacterial profiles and periodontal parameters as well (Gastel, 2007; Anhoury, 2002; Kim, 2010). The increased pathogenicity of plaque during orthodontic therapy has been described by several authors (Cerroni, 2018). During treatments there appears to be a shift in the subgingival microbiota: an increase in the total bacterial load, including Spirochetes, fusiform bacteria, rods, and gram-negative anaerob species has been reported concomitant with a reduction in gram-positive and aerobic bacteria (Kim, 2010). A clinical study showed that, after three months of fixed orthodontic application, the periodontal parameters of plaque index, gingival index, gingival bleeding index and pocket probing depth increased due to a considerable cleaning difficulty. Consistently, the microbiological parameters showed the maximum number of bacterial species after three months of orthodontic treatment (Ristic, 2007).

WHY RESORTING TO NON-DRUG TREATMENTS?

A proper maintenance of oral hygiene during orthodontic therapy could prevent permanent periodontal damage (Cerroni, 2018). There is evidence of a significant loss of periodontal attachment, measured by the distance from the cemento-enamel junction to the alveolar bone crests, after fixed orthodontic treatment (Jansson, 2003). Gingival inflammation is treated with the removal of the supragingival biofilm and by reestablishing a healthy microflora with daily oral hygiene practices. Professional mechanical cleaning of the teeth is the preferential treatment followed by oral hygiene at home (Wilder and Bray, 2016; Larsen and Fiehn, 2017). The gold standard for removing plaque biofilm and tartar deposits is scaling and root planing which can be performed by hand or with ultrasonic instruments (Galgut, 2004; Wilder and Bray, 2016). In the more aggressive forms of periodontitis, if infection persists, surgery may be required to correct the damage occurring in hard and soft tissues (Larsen and Fiehn, 2017; Harvey, 2017). Antimicrobial agents may be used as part of the treatment therapy and include systemic antibiotics, locally delivered antimicrobials, and over-the-counter products as mouth rinses, typically with chlorhexidine 0.2% cetylpyridinium chloride, or triclosan (Harvey, 2017). Chlorhexidine still



remains the most effective antimicrobial in reducing biofilm-related complications in orthodontic patients (Sari, 2007), although its long-term use is known to stain teeth and tongue and to affect taste sensation. The benefits of fluoride-containing toothpastes and mouthrinses in preventing caries have been well established, and besides aiding enamel remineralization, fluoride acts as a buffer to neutralize acids produced by bacteria and suppresses their growth. However, the more aggressive forms of periodontitis characteristically do not respond well to simple mechanical treatment. Systemic antibiotics are usually prescribed for patients with severe infections or unresponsive to mechanical therapy. On the other hand, **antibiotics alter and even disrupt the resident flora in the other body districts being thus associated with diarrhea and vaginal candidiasis and eventually adverse reactions can occur in patients with sensitivity to a particular agent.** However, in those subjects with mild to moderate periodontitis that typically respond well to mechanical treatment, to control symptoms and alleviate pain, **benefit can be gained by using products that provide stability and elasticity to the tissues and facilitate healing while inhibiting destructions of tissue.**

WHY HIGH MOLECULAR WEIGHT HYALURONIC ACID?

Hyaluronic acid (HA), or hyaluronan, is a naturally occurring non-sulphated, linear polymer composed of repeating units of glucuronic acid and N-acetylglucosamine (Chen, 1999; Kavasi, 2017). **HA levels are particularly high in the extracellular matrix of tissues undergoing rapid turnover, where regeneration and repair are occurring, such as the oral mucosa** (Valachová, 2016). HA has many different functions, including maintenance of tissue homeostasis and cell surface protection, but is also involved in many physiological processes, such as cell attachment, migration and proliferation, embryogenesis, wound healing, and regulation of immune response and inflammation (Kavasi, 2017). High molecular weight hyaluronic acid (HMWHA) is deposited in normal tissues and interacts with other components of the ECM to control the structural organization of ECM and signalling. In general, endogenous HMWHA possesses



enhanced anti-angiogenic, anti-inflammatory and immunosuppressive properties (Kavasi, 2017). High molecular weight hyaluronic acid (HMWHA) is a linear molecule with a highly complex secondary and tertiary structure in aqueous solution; its amphophilic nature allows this molecule to trap large quantities of water and, at the same time, to bond to hydrophobic molecules such as the lipidic substances of cell membranes (Scott, 1998). This property is relevant in controlling hydration and contributes to retardation of viral and bacterial passage through the hyaluronan-rich pericellular zone, as well as during periods of change when HA levels are elevated, during inflammatory processes (Chen, 1999). **Clinical studies have shown that HA accelerates the healing of various types of wounds, including burns, epithelial surgical wounds, and chronic wounds** (Shaharudin, 2016).

Why Gengigel®?

The devices belonging to the Gengigel® family achieve their expected performance due to the action of its principal component, high molecular weight hyaluronic acid, (HMWHA), which makes Gengigel® strongly bioadhesive, an effect that may be enhanced by using a calibrated mixture of some ancillary glycopolymers. In this way Gengigel® adheres to the oral mucosa long enough to promote the activation of the physiological tissue repair process, improving the healing response and reducing healing time. Further, by maintaining the balance of extracellular fluids, again because of the presence of high molecular weight hyaluronic acid, it promotes resorption of oedema in inflammatory states, rapidly reducing the associated pain. Last but not least, it protects the oral mucosa from harmful agents, preserving the micro-environment of the mucosal surface, and regularizing the growth of bacterial flora.

Clinical evidence concerning Gengigel® includes clinical data from prospective, comparative studies, which can thus be considered to be of high quality. Furthermore, several studies had a split-mouth design, which facilitated their interpretation by minimizing the effects of inter-patient variability. The studies covered different Gengigel indications, including management of clinical signs associated with periodontal disease or gingival inflammation following surgical periodontal therapy. In all cases, the patients were treated with the gel formulation, either in a single application given at the time of surgery, or with multiple applications following the initial periodontal surgery/treatment. Depending on the study, the follow-up period varied between 7 days and 6 months, providing sound clinical data on the effectiveness of long-term treatment with Gengigel®.

In particular, a fluid formulation of 0.1% HMWHA (Gengigel® Professional Fluid) was used in a trial for the treatment of gingivitis in 200 children aged between 6 and 16 years. Male and female were similar in number, with 43 of having fixed orthodontic treatment. While showing high compliance to the treatment, paediatric patients also reported immediate reduction in bleeding after HA application (Farronato, 2002).

Medical devices containing hyaluronic acid, such as Gengigel®, may represent a safer alternative to other medications with pharmacological action for gingivitis and periodontitis. This is particularly true for young patients who undergo orthodontic treatments where the use of Gengigel® fasten the healing of wounds without side effects avoiding resorting to analgesics.



REFERENCES

- Anhoury P, Nathanson D, Hughes CV, Socransky S, Feres M, Chou LL. Microbial profile on metallic and ceramic bracket materials. *Angle Orthod* 2002;72:338-43.
- Bollen AM, Cunha-Cruz J, Bakko DW, Huang GJ, Hujoel PP. The effects of orthodontic therapy on periodontal health: a systematic review of controlled evidence. *J Am Dent Assoc*. 2008;139:413-22.
- Cerroni S, Pasquantonio G, Condò R, Cerroni L. Orthodontic Fixed Appliance and Periodontal Status: An Updated Systematic Review. *Open Dent J*. 2018;12:614-622.
- Chen WY, Abatangelo G. Functions of hyaluronan in wound repair. *Wound Repair Regen*. 1999;7:79-89.
- Farronato G, Tremolati M, Ceschel G, Falcicola L. Hyaluronic Acid in the management of gingivitis in young patients. *International Tissue Care Symposium*. Abst, September 3, 2002, Frankfurt am Main.
- Gastel J, Quirynen M, Teughels W, Coucke W, Carels C. Influence of bracket design on microbial and periodontal parameters in vivo. *J Clin Periodontol* 2007;34:423-31.
- Galgut PN. New ways to Manage Periodontal Diseases. Word of Mouth Publication of Brit Dent Health Foundation. 2004; 44-45.
- Harvey JD. Periodontal Microbiology. *Dent Clin North Am*. 2017;61:253-269.
- Janson G, Bombonatti R, Brandão AG, Henriques JF, de Freitas MR. Comparative radiographic evaluation of the alveolar bone crest after orthodontic treatment. *Am J Orthod Dentofacial Orthop*. 2003;124:157-164.
- Kassebaum, N. J., Smith, A., Bernabé, E., Fleming, T. D., Reynolds, A. E., Vos, T., Murray, C., Marcenes, W., & GBD 2015 Oral Health Collaborators. Global, Regional, and National Prevalence, Incidence, and Disability-Adjusted Life Years for Oral Conditions for 195 Countries, 1990-2015: A Systematic Analysis for the Global Burden of Diseases, Injuries, and Risk Factors. *Journal of dental research*. 2017; 96:380-387.
- Kavasi RM, Berdiaki A, Spyridaki I, Corsini E, Tsatsakis A, Tzanakakis G, Nikitovic D. HA metabolism in skin homeostasis and inflammatory disease. *Food Chem Toxicol*. 2017; 101:128-138.
- Kim K, Heimisdottir K, Gebauer U, Persson GR. Clinical and microbiological findings at sites treated with orthodontic fixed appliances in adolescents. *Am J Orthod Dentofacial Orthop*. 2010;137:223-8.
- Larsen T, Fiehn NE. Dental biofilm infections - an update. *APMIS*. 2017;125:376-384.
- Mariotti A, Mawhinney M. Endocrinology of sex steroid hormones and cell dynamics in the periodontium. *Periodontol* 2000. 2013;61:69-88.
- Meeran NA. Iatrogenic possibilities of orthodontic treatment and modalities of prevention. *J Orthod Sci* 2013; 2: 73-86.
- Ren Y, Jongsma MA, Mei L, van der Mei HC, Busscher HJ. Orthodontic treatment with fixed appliances and biofilm formation--a potential public health threat? *Clin Oral Investig*. 2014;18:1711-8.
- Ristic M, Vlahovic Svabic M, Sasic M, Zelic O. Clinical and microbiological effects of fixed orthodontic appliances on periodontal tissues in adolescents. *Orthod Craniofac Res* 2007; 10:87-95.
- Sari E, Birinci I. Microbiological evaluation of 0.2 % chlorhexidine gluconate mouth rinse in orthodontic patients. *Angle Orthod* 2007;77:881-884.
- Shaharudin A, Aziz Z. Effectiveness of hyaluronic acid and its derivatives on chronic wounds: a systematic review. *J Wound Care*. 2016 ;25:585-592.
- Valachová K, Volpi N, Stern R, Soltes L. Hyaluronan in Medical Practice. *Curr Med Chem*. 2016;23:3607-3617.
- Vetter-O'Hagen CS, Spear LP. Hormonal and physical markers of puberty and their relationship to adolescent-typical novelty-directed behavior. *Developmental psychobiology*. 2012; 54:523-35.
- Wilder RS, Bray KS. Improving periodontal outcomes: merging clinical and behavioral science. *Periodontol*. 2000. 2016;71:65-81.



FOR FURTHER INFORMATION
ABOUT GENGIGEL® AND ITS
TECHNICAL AND SCIENTIFIC
BACKGROUND USE THIS
QR-CODE TO DOWNLOAD
THE DEDICATED
WHITE PAPER



RICERFARMA S.R.L.
www.ricerfarma.com

Via Egadi, 7 - 20144 Milano – Italy
info@ricerfarma.com