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APPLICATION OF XYLOMETAZOLINE FOR CHEMO-MECHANICAL RETRACTION OF THE FREE GINGIVA

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SUMMARY

To carry through a contemporary treatment plan in accordance to the functional, prophylactic and esthetic requirements in fixed prosthodontics the dental specialist needs highly precise impressions for perfect marginal fit of the constructions. An accurate impression of the marginal details of the preparations is the only way to successful restorations in prosthetic dentistry. Gingival retraction is a long established technique which allows access in preparation, guarantees ingress of impression material around the preparation shoulder into the gingival groove and facilitates cementation procedures.

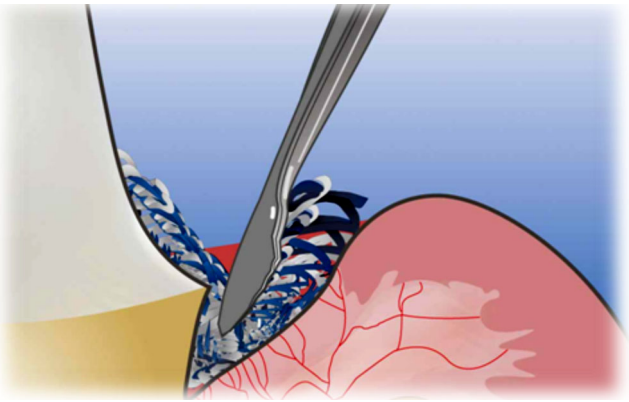
Keywords: Gingival retraction, Xylometazoline, A-silicone, C-silicone, retraction agents,

PURPOSE: The purpose of this study is to evaluate the effect of one á-adrenomimetic decongestant - clinically approved nasal drops – 0,05% xylometazoline hydrochloride, when applied as chemical agent for chemo-mechanical retraction of free gingiva prior.

INTRODUCTION:

Gingival retraction involves the displacement of marginal soft tissues around a tooth, mainly to allow access in preparation, precise impression taking and cementation procedures. (Fig.1)

Fig. 1. Insertion of retraction cord into the gingival groove



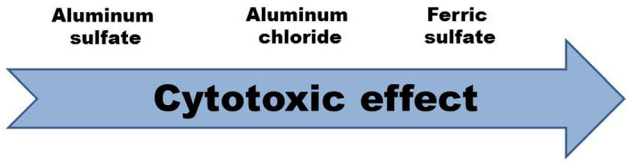
One of the main problems in impression taking is how to assure the access of the low viscosity impression materials into the gingival groove around the preparation shoulder. The presence of blood and crevice fluid in the gingival groove are also stumbling stones for the impression procedures because of the hydrophilic chemical nature of most of elastomeric impression materials.

One of the most popular methods is the chemo-mechanical retraction via cord, impregnated with chemical agent to obtain hemostasis and reduction of crevice fluid. [1]

Sympathicomimetic (vasoconstrictors) and astringents (clotting agents) are the 2 main groups of impregnating chemical substances. [2] Among sympathicomimetic agents, epinephrine (adrenalin) is preferred for its effective vasoconstriction and hemostasis. Adrenalin causes systematic side effects through â-1 and â-2 adrenergic receptors and affects the overall health of the patient. [3] The condition is known as “epinephrine syndrome”. [4] Adrenalin is contraindicated in cases of heart or endocrine diseases. On the other hand, there are enough scientific proofs about the strong cytotoxic effect of the epinephrine impregnated retraction cords over the gingival fibroblasts even in short exposure periods. [5]

The conventional retraction agents from the group of astringents are metal salts in different concentration - aluminium chloride, aluminium sulfate, ferric sulfate, zinc chloride, etc. A lot of in vitro experiments demonstrate their harmful effect not only for gingival tissues but also hard tooth tissues. (Fig.2) [5, 6, 7]

Fig. 2. Aluminum sulfate shows the lowest cytotoxicity, followed by aluminum chloride and the ferric sulfate as most harmful agent. [8]



Astringent compounds are chemically stable and active only within narrow diapason of acidic pH which causes etching of the hard tooth tissues and postoperative sensitivity of vital teeth. [9]

Because of the disadvantages of the conventional retraction agents scientists continue searching for the most biologically compatible chemical compounds for cord impregnation. In 1991 Bowles et al offer a new application for the nasal and eye decongestants oxymetazoline hydrochloride, xylometazoline hydrochloride and tetryzoline - Visine® (tetrahydrozoline HCl 0,05 % , Pfizer, Warszawa, Poland), Afrin® (oxymetazoline 0,05 %, Schering- Plough, Brussels, Belgium) and Neosynephrine® (phenylephrine HCl 0,25 %, Ursapharm, Saarbrucken, Germany) as retraction agents. All 3 á-adrenomimetic compound lead to effective retraction of margo gingivalis without affecting the periodontal and overall health. [4, 10] Although the reported data about effectiveness of á-adrenomimetic substances as retraction agents is promising , they still are called "experimental" in the science literature.

MATERIALS AND METHODS:

The research included 90 teeth. The depth of the gingival groove was measured in 4 points (MV, DV, ML, MP) with electronic periodontal probe Pa-on(Orangedental GmbH & Co. KG, Germany) and preparation for fixed prosthetic constructions was done. Ultrapak retraction cord (Ultradent Products Inc., USA) of 4 sizes (000, 00, 0, 1) impregnated with Xylometazolin 0,05% (Xylometazoline hydrochloride 0,05%, Warsaw Pharmaceutical Works Polfa S.A., Poland) (Fig.3)was inserted in the gingival sulcus.

Fig. 3. Xylometazoline (Xylometazoline hydrochloride 0,05%, Warsaw Pharmaceutical Works Polfa S.A., Poland)

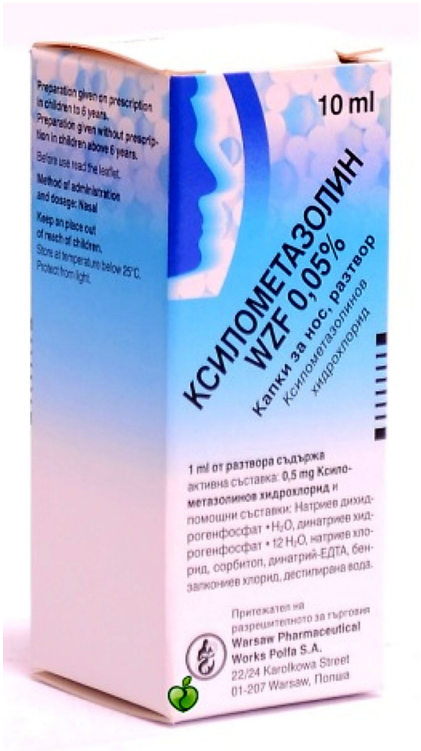


Fig. 4. AmScope SM-5TZ-FOR-5M (AmScope Company, USA)

Two-step two-layer technique was applied for the whole group of 90 teeth. Two groups were divided according to the type of elastomeric impression material :

- *1st group* – 45 teeth with polyvinylsiloxane impression material – Affinis® Putty soft & Affinis® Precious regular body (Coltene /Whaledent Inc.);

- *2nd group* - 45 teeth with polydimethylsiloxane impression material – Zetaflow® Hydrophilic Putty & Zetaflow Hydrophilic Light® (©Zhermack Clinical SpA, Italy);

Impressions were sectioned into the points of periodontal measurements. Thus 360 slices were obtained – 180 with polyvinylsiloxane and 180 with polydimethylsiloxane impression material.

The impression sections were studied under electronic microscope AmScope SM-5TZ-FOR-5M (AmScope Company, USA) (Fig. 4) under x35 magnification. Images were taken and measurements of the silicone ingress into the gingival sulcus were held by software – ZEN 2012 Blue Edition (Carl Zeiss Microscopy GmbH). In this way the retraction effect of Xylometazoline was assessed.

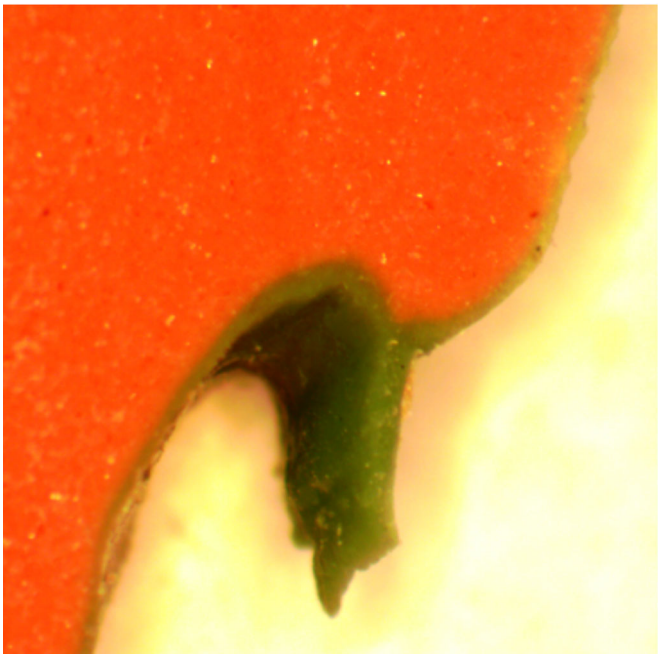
Statistical analysis was performed using commercial SPSS v. 20 for Windows. The significance of differences between the mean values of the different groups was assessed by the analysis of variances (ANOVA) with values of $p < 0.05$ taken to imply statistical significance.

RESULTS:

For the 1st group – 180 sections of polyvinylsiloxane impression material (A-silicone)

The mean value of the ingress of the polyvinylsiloxane impression material after the retraction with Xylometazoline is 1,07 mm ± 0,35 mm (59,28% ± 15,24%), the minimal value is 0,408 mm (21,47%), the maximum value – 1,97 mm (93,83%). It is significant to highlight that 76,10% of the impression sections have ingress of the Affinis® Precious regular body layer more than half of the total depth of the gingival groove.(Fig.5)

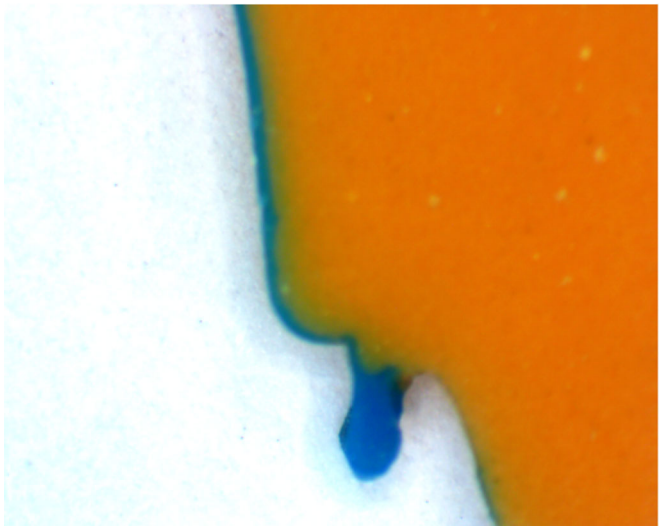
Fig. 5. Impression section of A-silicone chemo-mechanical retraction with Xylometazoline 0,05%



For the 2nd group – 180 sections of polydimethylsiloxane impression material (C-silicone)

The mean value of the ingress of the polydimethylsiloxane impression material after the Xylometazoline retraction is 0,84 mm ± 0,38 mm (57,23% ± 24,74%), the minimal value is 0,27 mm (10,77 %), the maximum value – 1,99 mm (100 %). 55% of the impression sections show ingress of the Zetaflow Hydrophilic Light® layer more than half of the total sulcular depth.(Fig.6)

Fig. 6. Impression section of C-silicone after chemo-mechanical retraction with Xylometazoline 0,05%



DISCUSSION:

Xylometazoline 0,05% shows better results when applied as chemical retraction agent with A-silicone as the ingress of the polyvinylsiloxane impression material was more than half of the total depth of the gingival sulcus in 76,10%. This value is 21,10% lower when C-silicone is used for the impression technique after Xylometazoline retraction (55%).

Fig. 7. Retraction effect of Xylometazoline 0,05% as impregnating agent for chemo-mechanical displacement of gingival groove

CONCLUSION:

Xylometazolin 0,05% shows excellent results as impregnating agent for chemo-mechanical retraction of the free gingival margin (Fig. 7). It is as effective as the conventional chemical agents. An important advantage of this á-adrenommimetic substance is the absence of any cytotoxic influence over the soft tissues shown by the astringents and epinephrine. Last but not least, Xylometazoline does not affect the overall health of the patients.

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