

Minimum Invasive Dental Concept in Prevention and Conservative Treatment – From Research and Science to Practice

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Abstract: *The minimum invasive dental concept is based on practical experience for more than 30 years of the negative trends from the use of resin materials in distal teeth and early metal-ceramic “aesthetic” crowns and bridges. The scientific dental research includes all aspects of the conservation in dental caries treatment which are scientifically and clinically proved with most up to date methods and tests: anthropometric, epidemiological, biochemical, immunohistochemical, electron microscopy, polarized light microscopy, light induced fluorescence, microradiography, microbiology, genetic tests etc. Experiments in situ, in vitro, animal tests, clinical research in the last 31 years were focused in the field of prevention of dental caries, treatment of precavitated precarious lesions with nanotechnologies, preparation of hard dental tissues with most conservative techniques, adhesive restoration methods with amalgam and resins. The conclusions can be focused on basic principles and refocused in the 21 century like: Dental caries is not only predictable and controlled disease but is also a polyethiological disease on a community and population levels and uni- or bi-ethiological on an individual level. The minimum invasive dental concept in cariology leads to prevention of endodontic treatment, early extractions and early prosthetic medical procedures.*

Keywords: conservative dentistry, cariology, prevention, restoration

The understanding of presorptional (local) and postresorptional, (systemic) or metabolic effects of **foods, snacks and beverages** in the mouth via **saliva and gingival fluids** were our first basic targets since 1985. The active ingredients from resent, modern foods, snacks and the mechanisms of control on frequency and numbers of their intake are fully responsible for bacterial counts in saliva and plaque, and for the composition of the mineralized tissues in the mouth – enamel, dentin, cementum and bones (22,23,28). The relations, amounts and proportions of carbohydrates, fats, proteins and minerals are directly leading to the phase composition and to the size of the crystallites of hydroxyapatite, fluorapatite, three calciumphosphate, carbonate apatites, lipoproteins, fatty acids, phospholipids (1, 2, 3, 4, 35,40).

The buffer capacities of saliva are related not only to foodstuffs, but also to genetic factors such as: size and structure of the salivary glands (7, 8, 9, 10, 19). Absorption of important macroelements like calcium, phosphates and fluoride are dependent on the presence or absence of systemic diseases or metabolic disorders like diabetes and obesity (1, 8, 9, 17). In the last two decades there is a significant number of patients complaining from lower salivary flow rates, burning mouth syndrome or even xerostomia. Patients with Gougerot-Sogrens syndrome are also more compared with 25-30 years ago. Early metal-

aesthetic crowns and bridges, polymetallic constructions, large restorations and dentures are leading to a slow but secure decrease of the salivary flow rate and changes into the composition of salivary trace and macroelements, enzymes and defense systems (5, 11, 12, 36-39).

A number of simple **dental tests** in dental patients can obtain a clear picture on dental caries activity - DMF counts, on the rates of bacteria – chair aside tests for microbial counts of Str. mutans and Lactobacillus in saliva and salivary defense systems – with pH curves for sucrose clearance, buffer capacity tests, salivary stimulation tests (22,23,28).

Early **diagnosis** is essential for minimum invasive treatments. In the last 25 years this was a topic with lots of speculations, marketing tricks, trade of commercial devises and “prenatal” treatment of early lesions. In a large number of dental practices and even in highly respected congresses I have seen a lot of mistakes in operative dentistry decision making of early lesions. Preventive restorative procedures are not in patients favor and if a cavitation will become a cavity with 2- 3 or 4 times enlargement, this is not a medical approach to the problem. This is a dental approach (30,31,32,33,34).



Figure 1: / a, d Light induced fluorescence with Sopro-Life in the diagnosis of secondary external defects in resin materials, b and c secondary caries in amalgam and resin restorations.

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Best distinguished diagnostic methods with medical-dental approach are knowledge, time, probes and dental mirrors, with respect to the individuals and family status, a biologic approach and follow up checks (24,25,26).

Restorations can be planned for the particular tooth, can be planned for the present status of the mouth, can be planned for both reasons, but also with a bright prospective for a conservative future of the patients occlusion in terms of 15-20-30 or even 40 years (24-26). The fracture resistance

depends a lot on the size of the crown, the amount of hard dental tissues, thickness of dentine, correct or incorrect presence or absence of pins and posts, conservative type of the cavities. A very important method in the treatment of class II cavities is the saving of the marginal ridge. Another advantage of this technique is the prevention of overhangs in class II restorations (21). Two types of class II cavities are often underestimated: tunnels and approximal conservative adhesive ones (15).



Figure 2: (a) Cohesive gold in dental caries treatment with survival rate up to 35-40 years, b - minimum invasive class one cavities and c - tunnels in the treatment of class II cavities

Special thanks to Dr Dan Henry from FL, USA for his kind permission for the use of cohesive gold restoration photo fig 2a.



Figure 3: Minimum invasive treatment of class II cavities includes training of operators in alternative cavities-approximal conservative adhesive cavity and tunnel preparation(a,b)

Another challenge in dental caries treatment which needs very minimum invasions and treatment approaches are **root caries** lesions (18,29). Practically the meaning of the concept here is right filling material and regular use of varnishes and remineralizing solutions. Research shows that resin materials are not the best solution of this problem and glass ionomers are not a radical approach. Overcoming microleakage on the cavity walls here is problem number one (39). Lower size of the dental crowns, which is an evolution fact, is generating a serious problem with the retention of pins (16).

Prevention of **secondary caries** and pulpitis can be focused on:

- 1) The use of best multifunctional adhesive systems with sources of fluoride for resin materials, amalgam and even ceramics like Prime bond.
- 2) A correct use of dental amalgam with annual polishing for prevention of frequent restoration changes.
- 3) Best instructions for a correct use of mouthrinses.
- 4) A scientifically honest, clinically responsible and noncommercial approach in rejecting the electric toothbrushes.
- 5) Remineralization of precarious lesions and reparation of existing large dental restorations (6, 7, 10, 13, 14).
- 6) A new revised approach to gold restorations: cast inlays, dental crowns, cohesive gold restorations.
- 7) Prevention of oral galvanism, polymetallic intraoral environment in contact with saliva and gingival fluid (12).
- 8) Food induced remineralization : xylitol, sorbitol, fluoridated milk, cheese, etc.
- 9) Medication – therapy with calcium, collagen, and vitamins-A, E, D can be miracles in target groups like pregnant women, climax, patients with systemic diseases.



Figure 4 (a,b): Polarized light microscopy of remineralized tooth surfaces with 5 ppm fluoridated milk in two different magnifications. The invasion cannot be less.

The **conclusions** can be focused on findings and basic principles and refocused in the 21 century like:

- 1) Dental caries is not only predictable and controlled disease but is also a polyethiological disease on a community and population levels and uni- or bi-ethiological on an individual level.
- 2) The minimum invasive dental concept in cariology leads to effective prevention of endodontic treatments, early extractions and early prosthetic medical procedures.

References

- [1] Boteva E. The impact of concentrated and refined foods in the etiopathogenesis of dental caries. Dissertation, Medical University, Sofia, 1988
- [2] Boteva E., Kostova M, Dulgerova E. "X-ray Diffraction Analysis of Teeth and Bones of Wistar Rats Fed on Four Different Isocaloric Diets". 38 ORCA Congress, 10-13 July 1991, Corfu, Greece, Abstr. Caries Research p. 218
- [3] Boteva E. Nutritional factors in dental caries etiology. Lecture. Dental Research Seminars. University of Glasgow. Dental School. 20.03.1993
- [4] Boteva E. "Effects of Nutrition on Dental Caries, Salivary pH and Biochemical Patterns in Metabolic Patients". 40 ORCA Congress, 7-10 July 1993, Drezden, Germany, Abstr. Caries Research, p.213
- [5] Boteva E., Robinson C, Kirkham J. "Effect of Cd and Zn on the Biomineralization of Enamel, Dentine and Bone". XXXXI ORCA Congress, 29-06/02-07 1994, Cork, Ireland, Abstr. Caries Research, p.207
- [6] Boteva E., Rugg-Gunn A, Higham S. "Remineralization of White Spot Carious Lesions with Fluoridated Milk". XXXXIII ORCA Congress, 3-6, July 1996, Aarhus, Denmark, Abstr. Caries Research, p.307
- [7] Boteva E. Delivery of Fluoride to oral tissues via milk. Lecture. Dept. of Oral Biol. University of Newcastle upon Tyne. May, 1996
- [8] Boteva E. Clinical studies on the effects of nutrition on the DE- and Re- mineralization of the mineralized dental tissues. Lecture. International Conference of Prophylaxis and Biomaterials. Poznan, 9-10. 06.1997
- [9] Boteva E. Proteinmediated fluoridation and enamel demineralization. Lecture. International Conference on Surface and Colloid Science. 6-12.07.1997, Sofia
- [10] Boteva E, Rugg-Gunn A. Proteinmediated Fluoridation and Enamel Remineralization: an In vitro Approach". Stoma 2000, 4, p.287-291
- [11] Boteva E., Dulgerova E. "Study on the Influence of Hydroxyapatite Suspension on the Kinetic of Enamel Dissolution". Stoma 2001, 2, p.121-124
- [12] Boteva E. Sucrose clearance in patients with oral galvanism. ACTA MedicaBulgarica, 2003, vol.30, p.90-94
- [13] Boteva E., Rugg-Gunn A. Fluoride retention in enamel slabs after rinsing or drinking F milk or F water. Amb, ActaMedicaBulgarica, 2004, 31, p.46-52
- [14] Boteva E. Adhesive remineralization in dental caries prevention. Lecture. IV International Congress of Medical Sciences-ICMS. Sofia, 12-15.05. 2005
- [15] Boteva E Tunnel restorations of Class II Caries lesions. 56 Annual ORCA Congress Budapest, Hungary, Caries Research, 2009, 43, 3 p.231, Abstr.145,
- [16] Boteva E. Significance of the size of the clinical crowns of molars in cariology and endodontics. AMB, ActaMedicaBulgarica, 2010, 2, p.94-98
- [17] Boteva E. Dental, oral and metabolic changes in patients with diabetes type II and hyperlipidemia. In Bulgarian language, IN: Prevention, Diagnosis and Therapy – Actual Problems. Havities, 2012, p. 625-628
- [18] Boteva E. Marinova M, Karayashva D. An in vitro study of root caries in front teeth. AMB, ActaMedicaBulgarica, vol. XXXIX, 2/2012, p.68-71
- [19] Boteva E, Peycheva K. Detection of Dental Hypoplasia- Ability of Fluorescencemethods. AMB, ActaMedicaBulgarica, vol. XL, 1/2013, p.61-64
- [20] Boteva E. Karayashva D, Marinova M. Frequency of root caries in teeth with sound crowns 60th Annual ORCA Congress, Liverpool, UK, 3-6, VII, 2013, Car. Res. 2013, Abstr. p. 439, №62
- [21] Boteva E., Peycheva K, Karayashva D. Frequency of iatrogenic changes caust from overhang restorations. AMB, ActaMedicaBulgarica, 2, 2015, p. 30-35
- [22] Karayashva D., Marinova M., Boteva E. Salivary flow rate, buffer capacity, microbial counts, and caries activity of young healthy subjects. 57 Annual ORCA Congress, 7 -10, 07, Montpellier, France, Caries Research, 2010, Abstr.55,
- [23] Karayashva D., Marinova-Takorova M., Boteva E. A study on salivary clearance in dental caries prediction. Arch. Of the Balkan Medical Union, vol.49, 3/2014, p.319-323
- [24] Karayashva D., Glushkova M, Kadiyska T, Boteva E. Association study of the role of Glut 2 receptor in dental caries susceptibility, dietary habits and body mass index-BMI. International Journal of Science and Research, 5, 3, 2016, p.83-86
- [25] Karayashva D., Glushkova M, Boteva E, Mitev V, Kadiyska T Association study for the role of Matrix metalloproteinases 2 and 3 gene polymorphisms in dental caries susceptibility. Arch Oral Biology, 68, 2016, p. 9-12,
- [26] Karayashva D., Glushkova M, Kadiyska T, Boteva E The role of matrix metalloproteinases (MMP2 and MMP3) gene polymorphisms in dental caries susceptibility. 63 ORCA Congress, 6-10 July 2016, Abstr. Caries Research 59, p.27
- [27] Marinova-Takorova M, Karayashva D, Boteva E. Evaluation of microleakage at the interface between cavity walls and giomer and silorane based resin-in vitro study. ScriptaScientificaMedicinaeDentalis, 1, 1, 2015, p.38-42
- [28] Marinova M., Boteva E, Kalinov K. The role of unstimulated saliva as a risk factor for the development of root caries. 62 ORCA Congress, 1-4 July, 2015, Abstr. Caries Research 49, 2015, 315
- [29] Marinova M., Boteva E, Kalinov K. A study on the connection between root caries and periodontal disease. Comptesrendus, 69, 2016, 9, p.1239-1244.
- [30] Peycheva K., Boteva E. Methods for diagnosing dental fluorosis: Quantitative Laser fluorescence and Light-Induced fluorescence. AMB, ActaMedicaBulgarica, vol. XL 1/2013, p.53-60
- [31] Peycheva K., Boteva E. A Clinical study on dental fluorosis with Light Indused Fluorescence. IJSR,

- International Journal of Science and Research, vol.4, 3/2015, p.1239-1241
- [32] Peycheva K., Boteva E.. A clinical study on dental fluorosis with light induced fluorescence. International Journal of Science and Research, vol.4,3, 2015,p.1239-1241
- [33] Peycheva K., Boteva E. A comparison of different methods for fissure caries detection. AMB, ActaMedicaBulgarica, 1, 2016, p 30-38
- [34] Peycheva K., Karayasheva D, Boteva E. Diagnostic abilities of light induced fluorescence- LIF with SoproLife device. 63 ORCA Congress, 6-10 July 2016, Abstr. Caries Research 137, p.61,
- [35] Robinson C., Shore R, Bonas W, Brookes S, Boteva E, Kirkham J “Identification of Human Serum Albumin in Human Caries Lesions of Enamel”, Caries Research, 32/3/1998 p.193-199
- [36] Rugg-Gunn A., Boteva E. “Fluoride and Calcium Retention in the Mouth after Rinsing with F-milk or F-water”. Stoma 2000, 3, c.223-226
- [37] Rugg-Gunn A., Boteva E, “Retention of Fluoride and Calcium in the Mouth after Rinsing with Fluoridated Milk or Fluoridated Water”. XXXXIV ORCA Congress, July 2-5 1997, Dundee UK., Caries Research 3, p.302,
- [38] Rugg-Gunn A., Boteva E. “Fluoride Retention in The Mouth after Rinsing with F-milk or F-water”, 3 IADR/CED Sept. 1996, Berlin, Journal of Dental Research 1997, May, Vol,76,5, Abstr 089, p.1105, p.80
- [39] Rugg-Gunn A., Boteva E, “Fluoride Retention in Enamel Slabs after Rinsing or Drinking F-milk or F-water”, IADR/CED Sept. 1997, Madrid, Journal of Dental Research 1998, May, Vol,77, 5, Abstr 357, p.1251, p.105,
- [40] 40. Shore, R.S., Robinson C, Kirkham J, Boteva E. “Uptake of Albumin Amilase and IgG by Caries Lesions of Enamel”. XXXXI ORCA Congress, 29-06/02-07 1994, Cork, Ireland, Abstr. Caries Research, p.214
- [41] Special thanks to Dr Dan Henry from FL, USA for his kind permission for the use of the cohesive gold restoration photo fig.3,a.