

# Minimum Invasive Dental Concept in Endodontics – From Research and Science to Practice

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**Abstract:** *The minimum invasive dental concept in endodontics was based on 34 years of practical experience in the treatment of more than 10 000 endodontic cases, of the negative trends from the multiple use of resin materials in distal teeth and early metal-ceramic “aesthetic” crowns and bridges. The scientific dental research includes all aspects of endodontics, which are scientifically and clinically proved with up to date methods and tests: clinical exams, anthropometric measurements, epidemiological studies, biochemical tests, light induced fluorescence, different x-ray methods, microbiology, electroodontometric and genetic tests. Experiments with in vitro teeth n=2201 and clinical research in: diagnosis n=8911 teeth and successful treatment of n=3328 teeth in the last 15 years were focused in the preparation of hard dental tissues with most conservative techniques, irrigation, adhesive obturation and restoration methods with amalgam and resins, backup in endodontics in root canals preparation methods and in fixation of posts. A large amount of experience on negative trends and iatrogenic errors after condensation techniques, machine root canal preparations, high concentrations of irrigants and ultra sound methods was carefully analyzed and studied. Therapia magna can be harmful and machine rotary preparations are very rare good for teeth health. Condensation techniques are not universal. Their indications are much less than single cone ones. Balance of manual forces is a key to success. World is full of dentists, some of them are stomatologists, but only specialists in dental medicine are able to predict, prevent and to treat iatrogenic errors and to keep in the mouth, as long as possible sound teeth, restored crowns, endodontically treated teeth, roots with posts and cores, or even only natural roots for prosthetic reasons. The conclusions can be focused on basic principles and refocused in the 21 century like: The minimum invasive dental concept in endodontics leads to prevention of: early extractions, early prosthetic medical procedures, resorptions and to lifetime dental health. This plays a key role in prevention of oral polymetelia, gingival, periodontal and bone changes, metabolic disorders, gastrointestinal diseases.*

**Keywords:** dentistry, conservative dentistry, endodontics

The sensible balance between classical and modern treatment methods and the correct choice of dental materials is the biggest up to date challenge in dental medicine (17, 18, 19, 20). A wrong approach in cariology with excessive use of resin materials, underestimation of adhesive properties of silver dental amalgam led to large variety of malocclusion problems, implantology bum and early prosthetic measures (7, 11, 12, 13, 16). The current situation with the endodontic treatments is even worst. Endodonticsun fortunately is still on the “motorway” in the last few decades. Aggressive preparations with high concentration of irrigants, large amounts of solutions, large root canals preparations with rotary machine systems, hot and cold condensation techniques, ultra sound techniques are fact in most dental practices and in all dental schools and faculties.

They all have small number of indications and large list of exclusion criteria. They are often leading to practically forced endodontic treatments and to early dental loses (6). The minimum invasive dental concept is an approach which is based on saving maximum dentine in the root canal and elements of the pulp chamber and crown with aseptic, medication and obturation preventing the periapical bone from mechanical and chemical toxicity (17). A careful determination of inflammation and noninflammation endodontic diseases and endo treatments for prosthetic purposes is essential for a correct choice of intracanal irrigation and medication. Distilled water and saline in many cases are sufficient for evacuation of the smear layer (9,10).

**Fig 1**Thick layer dentin, sound bone thin dentin Periodontitis and Periapical Lesions



**Figure 1:** Balance between root canal preparation and medication

A common result from recent modern techniques in endodontics are internal and apical root resorptions- 2.98% in 2304 studied teeth radiologically detectable in vivo and 24.4 % from 451 extracted teeth with 1119 root canals in vitro. Resorptions often lead to early extractions (6). According to JOE the recent survival rates of endodontically

treated teeth has drop to 7 - 9 years, which is the lowest ever in the history of endodontics (6). Modern conservation techniques are not the single reason for this catastrophe. An important reasons are also the long term consequences from early aesthetic metal-ceramics prosthetics in front teeth and restorations of all dental arches. Chronic root traumas are

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leading to Periodontitis, Periapical lesions, bone defects, resorptions and early extractions.

always treatable - b. Minimum invasive approach works well in most cases even in teeth with most difficult anatomy—d and e.

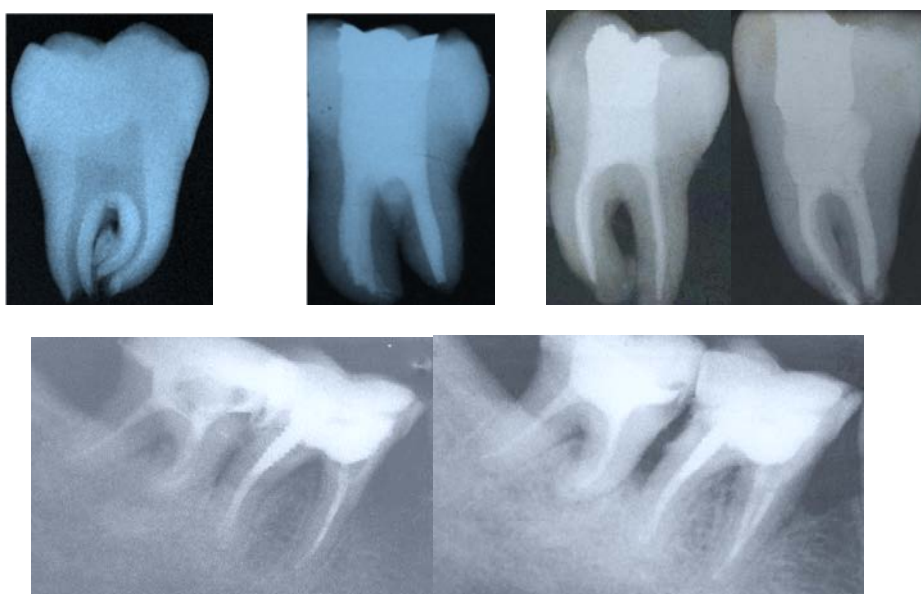
**Figure 2** Resorptions are not always radiologically visible – a, c and iatrogenic aggressive machine preparations are not



A minimum invasive sterile endo- treatments can obtain future better chances in retreatments and is essential for fixation of posts or changes of posts, saving bigger size of active dentine root surfaces, facilitating better conditions for restorative and prosthetic purposes (3,4). Retreatments are often impossible after a few from the modern obturation root canal systems. Lower crown sizes of the teeth in endodontics are even higher challenge not only for restorations after root preparation, but also for posts and for crowns and bridges on distal teeth (1,5). Saving all possible elements (lounges, orifices) of pulp chambers for retentive purposes can increase the resistance to occlusal trauma (1, 8, 16, 20). Root curvatures, resorptions, syndromes like Taurodontism, third

molars can be clinical difficulties which need realistic personal knowledge on the abilities of each operator. Teaching students in “Minimum invasive preparation and enlargement of root canals especially in Taurodontic teeth can save them in the mouth, instead of using them only in the preclinical courses.

**Fig 3.** Taurodontic teeth in students preclinical education (a-d) and in clinical situation, tooth 38 of a 65 year old patient (d,e). This teeth are difficult for initial and endodontic retreatments due to the short roots, large pulp chamber and canals, distal positions and very long terms of bleeding.



**Figure 4:** a, b, c Minimum preparation of 4 root canals on a lower molar– a, with and without metal posts - b cannot lead to cracks-c, fractures and bone losses - b, periapical lesions and extractions.

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Posts always need to be smaller for their first use, with minimum requirements in sizes and maximum respect to dentin in its thickness in the root. Always there must be a chance of fixation of a second post due to periapical or intracanal pathology, or due to acute or chronic occlusal trauma reasons. Pins can be reason for endodontic treatments (14, 15). **In endodontics a simple rule valids 100% - beginners and megalomaniacs are always useless.**

Apical enlargement and preparation higher than size 40 in the treatment of pulp pathology or for prosthetic purposes can only lead to excessive amounts of pasta and gutta-percha. Larger preparations are required only in cases with

smear layer, which needs to be removed. Any irrigations with more than 0.5 ml per one root canal with NaOCl more than 0.5-1% are harmful and more damage than to help (2).

**Fig 5** Four clinical cases of initial and after 3 months controls with minimum invasive treatment of periapical lesions: with smear layer – a,b, retreatment for untreated root canal – c,d, traumatical periodontitis after poor treatment under bridge – e,f. After minimum invasive treatment even teeth with worst prognosis (bone loss, internal and apical root canal resorptions) can remain in the mouth for years and even decades – g, h.



Obturation of root canals is always a function from the preparation and two rules are valid:

- 1) Therapia magna can damage treatment. Machine rotary preparations are very rare good for teeth health.
- 2) Condensation techniques are not universal. Their indications are much less than single cone ones. Balance of manual forces is a key to success.

**After various experiments with in vitro teeth n= 2201 and clinical research in diagnosis with teeth n=8911 and successful treatment of n=3328 teeth in the last 15 years we can summarize:** nobody wants “backup” in stone era, but lasers in diagnostic and treatments of enamel, gingiva, root canals and periapical pathology; x-rays in caries diagnosis, trauma, root fillings; CBCT in use from endo-diagnosis to follow ups purposes are definitely leading to an awful amount of radiation and all its side effects, from enamel and dentin mineral loses (proved as results from lasers), to papilloma’s and hypoplasia, bypasses and cancer.

The world is full of dentists, some of them are stomatologists, but only specialists in dental medicine are able to predict, prevent and to treat iatrogenic errors and to keep in the mouth, as long as possible sound teeth, restored crowns, endodontically treated teeth, roots with posts and cores, or even only natural roots.

**The conclusions** can be focused on basic principles and refocused in the 21 century like: The minimum invasive dental concept in endodontics leads to prevention of early extractions, early prosthetic medical procedures and to lifetime dental health. This plays a key role in prevention of oral polymetalia, gingival, periodontal and bone changes, metabolic disorders and gastrointestinal diseases.

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