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Un nuovo protocollo terapeutico in endopedodonzia: caso clinico

A new therapeutic protocol for paediatric endodontics: a case report

RIASSUNTO

Scopo: presentare la procedura clinica di utilizzo dell'apparecchio ENDOX®, Endodontic System in endopedodonzia.

Sommario
Il trattamento dell'elemento deciduo con compromissione pulpare si rende necessario per molteplici ragioni: la terapia non è, infatti, solo di tipo sintomatico, volta cioè all'eliminazione del dolore, ma rientra in un programma più ampio di tipo preventivo.
In questo lavoro viene presentato un caso clinico nel quale è stato usato un dispositivo elettronico che, sotto controllo endometrico, invia impulsi calibrati di corrente ad alta frequenza per la sterilizzazione del sistema scanalare. La procedura clinica è risultata di facile attuazione ed è stato raggiunto sia un buon grado di disinfezione dei canali trattati che un'ottima compliance da parte del paziente grazie ai tempi clinici ridotti. Il caso illustrato mostra come l'utilizzo di tale apparecchio renda il trattamento endodontico degli elementi dentali della serie decidua sicuro e rapido, incrementando il successo terapeutico.

Punti chiave di apprendimento:
- La necessità di recupero dei decidui con compromissione pulpare.
- La terapia endodontica dei decidui.
- L'utilizzo dell'ENDOX®, Endodontic System in endopedodonzia.

ABSTRACT

Aim: to illustrate the clinical use ENDOX®, Endodontic System in paediatric endodontics.

Summary
The treatment of the deciduous teeth with irreversible pulpitis is often mandatory, due to many reasons: the endodontic treatment, in fact, is not only required to eliminate pain and/or discomfort, but it is part of a comprehensive therapeutic plan of dental prevention, as well. To achieve more predictable and consistent results a new technique has been developed, with the aid of an electronic device which transmits specific impulses to increase disinfection of the ndodontic space. The clinical procedure is described in the present case report and was found to be easy to perform and comfortable for the young patients . It is felt that the clinical use of the tested device is an aid to make endodontic treatment of the deciduous teeth more easy and rapid, thus increasing success rate

Key learning points:
- Why and when deciduous teeth must be endodontically treated.
- Operative techniques to endodontically treat deciduous teeth.
- The clinical use ENDOX®, Endodontic System in paediatric endodontics.

Lila Beach, April 2006
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Introduction

The anatomic peculiarity and physiological process of root reabsorption make paediatric endodontics a science subject to continuous adaptations in order to reach the final objective, that is to eliminate pain that afflicts young patients, resolve inflammation, restore the function and maintain the tooth in the dental arch. Currently deciduous elements are considered of extraordinary importance, as they have been recognized as a fundamental for the harmonious growth of maxillary function as well as the masticatory, phonetic and aesthetic functions. In the light of this fundamental supposition the motivation of the paediatric endodontist to maintain the deciduous elements in the oral cavity of a child is the consideration that it is the best way to maintain the space because without interfering with the eruption of the permanent tooth, it maintains in a uniform and constant way the space in the three dimensions, impeding the extrusion of the antagonist tooth and consents an adequate bone and periodontal support of the underlying permanent tooth, facilitating the eruption (1). It should be made clear that the mixed dentition is a dynamic entity that poorly adapts to space maintainers, which are static elements.

All researchers now underline the role of bacteria and their secondary products in the etiology of the disease of the pulp and periapical tissues. It is well known that infectious or non infectious pulp necrosis provokes almost constantly a delay in root absorption of the deciduous element, while an abscess on the deciduous necrotic element can impede the normal mineralization of the underlying permanent tooth. As a consequence of this affirmation, the most important and fundamental objective of the endodontic treatment of a deciduous element is the elimination of microrganisms situated in the radicular canal system. Considering the variety of bacteria present in the oral cavity and also in the infected root canal space, results most important the use of all mechanical and chemical means of ample spectrum of bactericide action. Today, traditional endodontics use substances able to unite the mechanical action to removal of bacteria in the root canal space with a cleansing disinfecting action that are more and more efficient and this allows for a higher increase in success in modern endodontics. The operator must know the objectives, know how to choose the type of solution and the method of irrigation and must know as well what influence the morphology of the canal can have with the action of the irrigating substances while all of this is even more important in paediatric endodontics, especially because of the peculiar anatomy of the canals. In order to optimize the phases of cleansing and disinfection of the odonto, the scope of this study has been that of evaluating the efficacy of an operative protocol in paediatric endodontics that uses an alternative system to conventional methods, that is, to use an electronic device to facilitate the execution of an operative therapy bettering the microbiological control and reducing drastically operating time. The principle of functioning of the device, Endox® (fig 1) is based on an electronic function that upon measuring the apex, sends a calibrated impulse of high frequency current vehicled by a fine electrode (needle) inserted into the radicular canal. These high frequency impulses go through the pulp tissue and its ramifications and vaporizes the finer parts (lateral canals and apical delta), while reducing the volume of the pulp in the radicular canal, facilitating its removal. The elimination of the bacteria and the consequent passage of electrical current and the electromagnetic field that is developed, such effect derives from multiple mechanisms, in particular electroporation, a method used in genetic engineering to alter transitorily the permeability of the cell membrane. Such an increase in impermeability is demonstrated as sufficient to inactivate microrganisms found in the radicular canal system including dentinal tubules.

High frequency current (9), in addition determines in particular conditions (low resistance present in the apex and in correspondence to lateral canals) a rapid and elevated increase in temperature that causes the vaporization (thermoblation) of the pulp tissue and at least a conspicuous volume reduction, which facilitates its removal. The increase in temperature inside the canal does not transmit to nearby tissue, for example the periodontium in which the increase is registered in a few degrees Celsius.

From studies reported in literature, the use of this device in infected canals seems to determine a reduction of the bacteria population of more than 99%. Through the introduction into the canal of a fine surgical steel needle, a brief and calibrated impulse of high frequency current (312Hz) for about one tenth of a second.

Two electrodes are attached to the equipment, a neutral electrode to be held in the patient's hand and another positive electrode, needle probe in which a needle of varying size based on the canal lumen of the tooth to be treated.

The equipment has an apical measurement function, which is based on the method of electronic impedance, low resistance between the needle and the oral mucosa can cause a false reading (example: saliva, acute caries, dental fractures etc). The tooth on which it is to be used should result on the external part, dry and clean avoiding all contact between the needle and any metal parts. On the control panel of the equipment there are tooth selection buttons, providing a proper frequency for different teeth to be treated; four selections are available: incisor, canine, premolar and molar. Upon reaching the proper length it is possible to commute the equipment from apical measurement function to the function for electrical impulses by pressing a foot pedal. In this phase the equipment commutes in 3-4 seconds and is ready for a high frequency impulse in the area where we have established to work. In open apex canals the ray of action from the tip of needle is about 1.2mm, therefore considering the length of the canal will require multiple impulses.

The scope of this study is to evaluate the bactericide effect of Endox in treatments of deciduous teeth that present irreversible pulpathy, evaluating the effective capacity of disinfection, the reliability of its use, the tolerability of paediatric patients during treatment.

Clinical Case

The patient is 8 years old and comes for visit of control. Upon the clinical examination a fistula is located in correspondence with element 8.4 (fig 2). A digital intraoral periapical ex-ray was done, it was possible to observe a vast area of osteolysis both to the root fork and to the distal canal of the element observed. (fig 3)

An endodontic treatment was done for the resolution of the lesion and the conservation in arch of the element until its physiological exchange. Element 8.4 was isolated with a rubber dam; disinfected the operator field with chlorhexidine 2%, the pulp chamber was opened with a round bur 0,14 mounted on an high speed handpiece using irrigation of sterile physiological solution from the internal circuit of the dental chair. (fig 4) Once the openings of the root canals were visible, file n15 was used to verify the patency and evaluate the anatomy. The cleansing with physiological solution was done, because the use of hypochlorite is not recommended to be used with the equipment, the explanation resides in the fact that an eventual residual of this substance in the apical zone would crystallize with an effect that would immediately be pushed outside the apex with an instantaneous increase in temperature that is had following the electrical impulse.

After drying with sterile paper cones from 20 to 30, the first microbiological collection was made (fig 5) with sterile paper cones held inside the canal for about one minute and then placed in a sterile phial containing 2ml of physiological solution for suitable transport. After the first collection, the canals were treated with Endox® with an appropriate needle (fig 6) (red needle length 24mm 0.15 diam) and from the pre-operatory ex-ray it was possible to see that the lesion originated in the distal canal: for this reason more electromagnetic impulses near the opening and in the third apical (fig7) were performed. It was necessary in order to allow the needle to enter the canal to enlarge the entrance of the canal opening with a ProFile 0.4 followed by cleansing with physiological solution.

At the end of the treatment, a second endodontic collection was made following the same procedure as the first.

The canals were then filled with pure zinco oxide eugenol. The patient as called back after one week for the final reconstruction of the crown in composite and to verify the retraction of the fistula process (fig8). Later, it was monitored by controls at a distance of one month to evaluate the healing of the periapical lesion (fig9).

The samples collected were sent to the laboratory and an aerobic culture was performed to evaluate the CFU (Unit Forming Colonies). Three different culture mediums were used to develop bacterial colonies and mycete communities: the first culture (Agar blood salt mannitol Mac Conkey) to develop cocci and bacill, a second culture (Saburò) for eventual mycetes and a third culture (plain Agar Muller-Hinton) specifically for enterococcus faelcalis. The cultures were set up for 48 hours at 37° C in Mac-sud ovens and then sent to be read with electronic readers Mini-Api to count the colonies developed.

Results

From the results obtained in this research it is concluded that good capacity of disinfection is reached in the canals treated. This is confirmation both by laboratory tests through the identification of the CFU. (CFU pre-treatment ±145.000, CFU post treatment ±11.000) that provides clinical evaluation in reference to the phlogistic process of the element examined; in addition a certain degree of osteoinduction promoted by the piezoelectric effect determined by the application of the electromagnetic field.

Conclusions

Our objective was to analyze the *in vitro* antibacterial activity and the tolerability of the new method on paediatric patients. Examining the results it is possible to affirm that the operative protocol offers excellent guarantees for its use, however the most important function is certainly the possibility to have control of disinfection in the endodont in a simple way, and above all no pain results and time in the chair is reduced, these characteristics well adapt to the use of this therapeutic procedure in the field of paediatric endodontics.

Fig. 1 - *L'ENDOX®.*

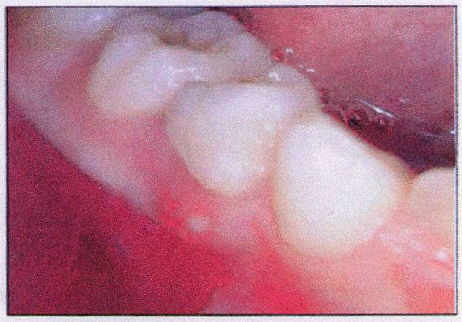

Fig. 2 - *8.4 necrotico con fistola.*

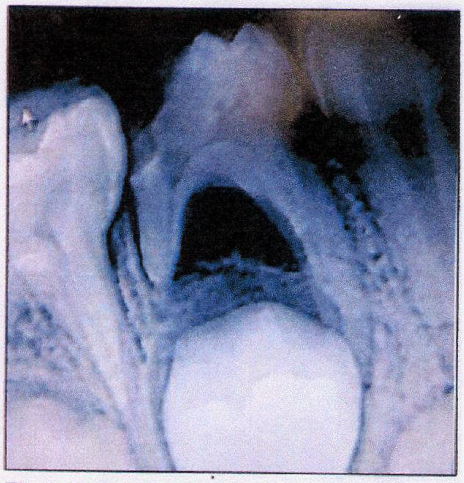

Fig. 3 - *Radiografia preoperatoria.*

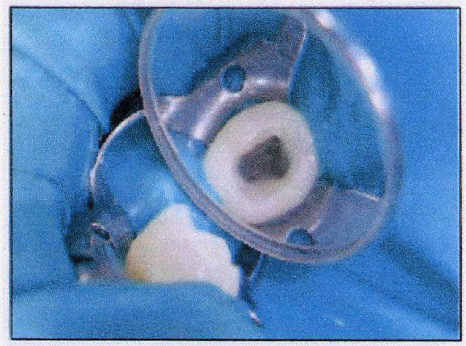

Fig. 4 - *Apertura camera.*

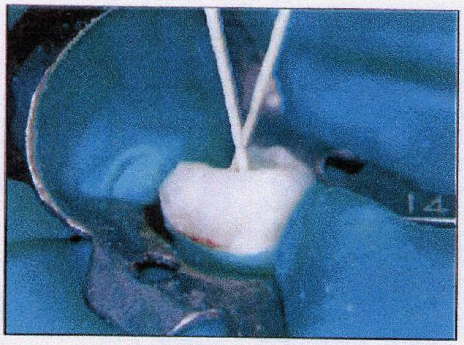

Fig. 5 - *Prelievo microbiologico.*

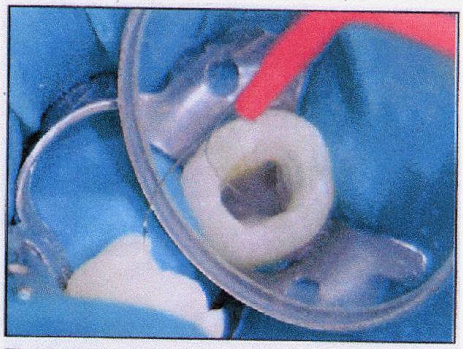

Fig. 6 - *Penetrazione sonda.*

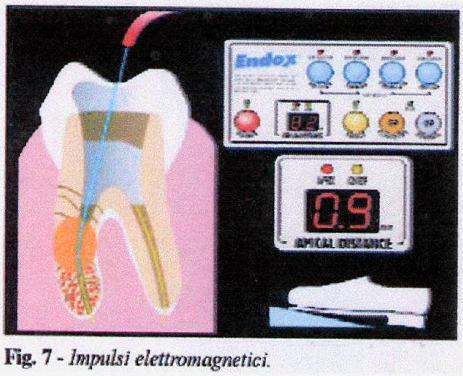

Fig. 7 - *Impulsi elettromagnetici.*

Fig. 8 - *Controllo a 5 giorni dal trattamento.*

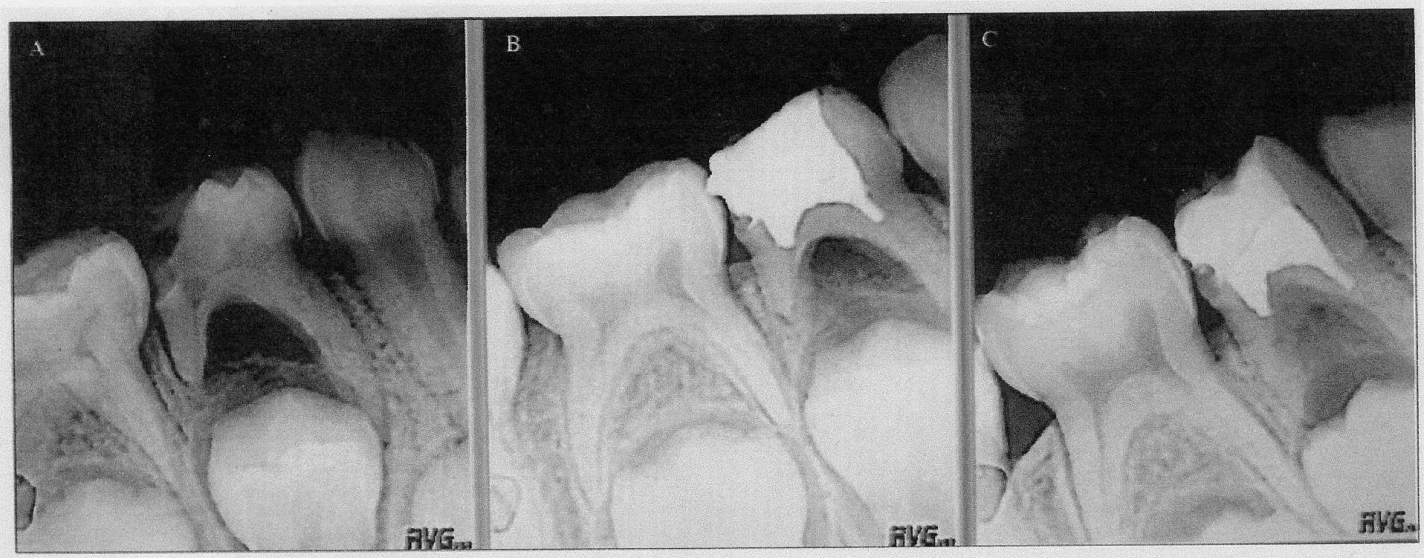

Fig. 9 - *Radiografie:* A) *preoperatoria, B) controllo a 1 mese, C) controllo a 3 mesi.*

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