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Endo vs Implant: What is your hierarchy in the decision-making process?

One of the most controversially debated topics of modern dentistry has been whether to retain a tooth with endodontic treatment, or to just extract it and replace it with an implant.

In the 1980s, implant dentistry became the mainstream treatment modality, with the purported promise of a maintenance free, definitive and long-term solution for a compromised tooth. It seems that the promise of the '80s has not materialised as expected, and times have certainly changed!

Endodontic treatment is regaining favour as the primary strategy for saving a tooth for a number of reasons. Despite the fact that endodontic treatment can be difficult to perform because of the complex anatomy of root canal systems, research has shown that the survival rate of endodontically treated teeth is at least as effective as dental implants, with the added benefit of maintaining the natural dentition. It's been well documented that implants are more predisposed to both biological and technical complications, which may require more remedial treatment overall. That said, implants offer an important next line option for patients where endodontic options have been exhausted.

The risk factors that may affect implant prognosis are plentiful. General risk factors may include, but not limited to: patients who have diabetes; immunosuppressive conditions; poor oral hygiene; history of periodontal disease; and, of course, those who smoke. Local factors may include, but not limited to: faulty implant placement technique; faulty ridge augmentation procedures; restorative failures; and deep peri-implant pocketing.

Plaque-related disease is more commonplace with implants than with the natural dentition. It is important to educate patients of this issue in order to maximise long term success rates of implants. One must also consider the reason why the patient lost their natural dentition in the first place, necessitating the need for extraction and subsequent replacement. Behavioural change, especially in high risk patients is of paramount importance.[1]

Dental imaging has made leaps and bounds with the advent and use of cone beam computed tomography (CBCT) enlightening us to the complexities of the root canal system, and thereby necessitating 3-D disinfection and obturation.

High magnification in the form of the dental operating microscope has enabled many practitioners to treat complex root canal anatomic variations more thoroughly and to tip the balance in favour of healing.

Although the hierarchy of treatment planning in the early days first looked at implants as the pinnacle of treatment compared to retaining the natural dentition with endodontic/restorative treatment, this has dramatically changed as increasing reports have come to light regarding the complications now associated with implants. The priority in recent years has seemed to revert back to maintaining the natural compromised teeth through remedial endodontic and restorative procedures.

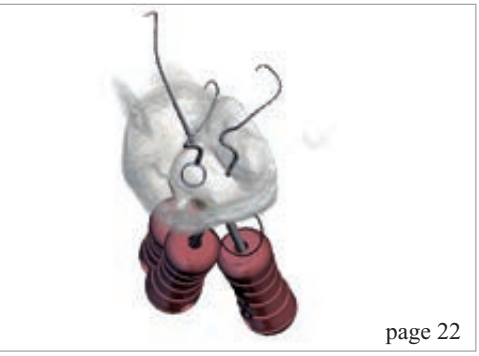
Dr Gary Glassman
Guest Editor

Dr Gary Glassman

Reference:

Thanks to the following article in which inspiration and thoughts were culled from:

[1] Nemcovsky CE, Rosen E. Biological complications in implant-supported oral rehabilitation: as the pendulum swings back towards endodontics and tooth preservation. Evidence-Based Endodontics 92017) 2;4.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*Study conducted by Samano et al., Universisdad Autonoma de San Luis de Potosi.

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Success evaluation of N2 treated teeth with open apical foramen—

A retrospective study

Authors: Dr Anette Joschko, Dr Robert Teeuwen & Prof. Jerome Rotgans, Germany

Abstract

95 teeth with open foramen were identified in a general dentist practice during the years 1985—2006, 75 of which could be followed-up by X-ray after an average time of 70 months (follow-up X-ray). 40 teeth were subject to vital extirpation (VitE), 28 teeth to vital amputation (VitA), and seven teeth with necrotic pulp underwent conservative root canal treatment (RT). Apexification success rate amounted to 85.3 % (VitE 90 %, VitA 85.7 %, non-vital RT 57.1 %). Another 12 % could be judged as partial success in molars, as a certain number of the molar roots showed apexification, however, others not yet. The percentaged difference of a successful apexification between vitally extirpated teeth and root canal treatment of non-vital teeth was significant ($p = 0.0243$). Apexification result was irrespective of the filling level of root canal treated teeth as well as of endodontic success.

Endodontic failures resulted in ten cases (13.3 %). Statistic significance was found regarding failure rate of VitA (7.1 %) and root canal treatment of non-vital teeth (28.6 %, $p = 0.0157$).

Within the observation period 19 out of the 95 teeth with open foramen (20 %) were extracted. There was a significant difference regarding extraction frequency between the VitE group (14.6 %) and the non-vital group (50 %, $p = 0.0169$).

Fig. 1: Probability of survival of the 3 therapy groups with the target criterion "No Extraction".

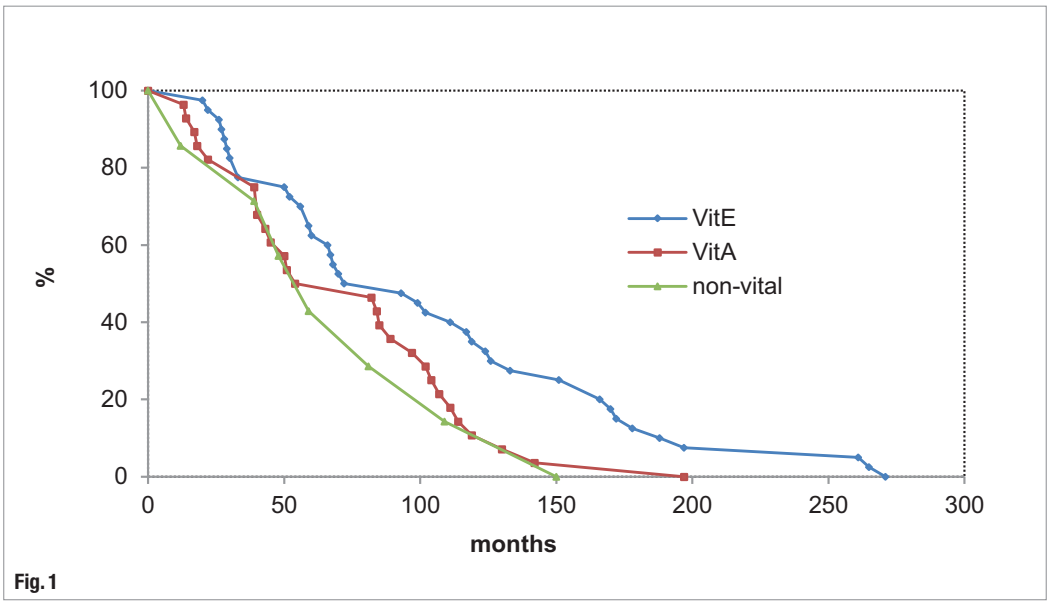

Fig. 1

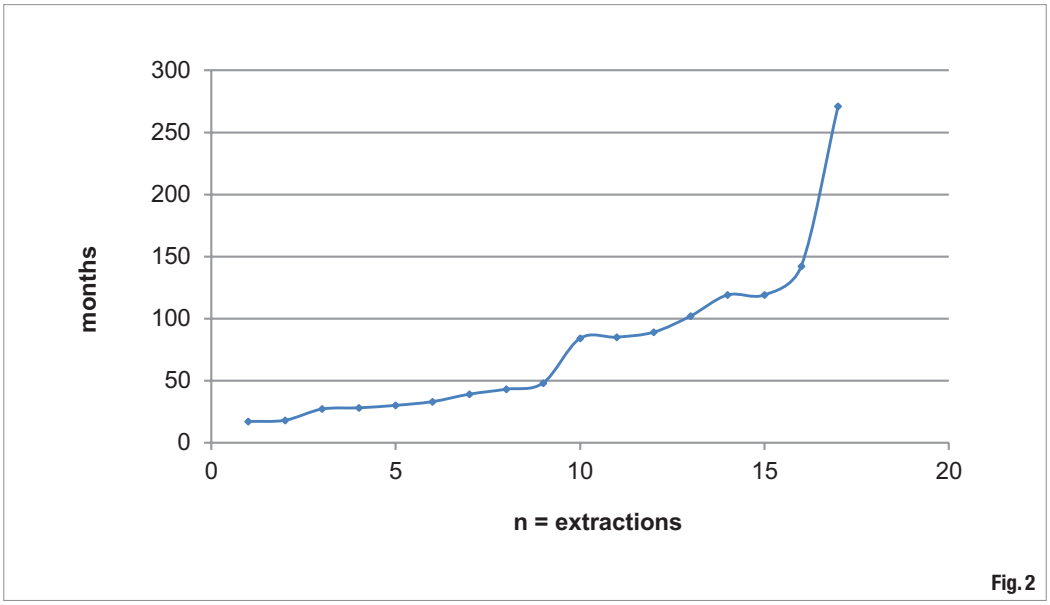

Fig. 2

Fig. 2: Time history of the extractions (N = 19).

Introduction

Endodontic treatment of teeth with incomplete root growth poses a special challenge. In young patients, the necessity for endodontic treatment results from an accident or profound caries. Aside from damage control, this treatment aims at promoting tooth maturation including narrowing respectively closure of the apical foramen (apexification) and possibly root extension (apexogenesis).

According to Zeldow (1967) the following treatment options are commonly used:

- For vital teeth: Pulpotomy (VitA) with subsequent conservative root canal treatment (RT)
- For non-vital teeth:
  - either RT or
  - RT in connection with apicoectomy/retrograde root canal filling or
  - inducing of bleeding with root canal filling in the coronal root part only.

Krakow et al. (1977) disapprove of a VitA inevitably following root canal filling. Joschko (2012) points out that the often diverging roots of immature teeth exclude a dense root canal filling, and that open apical foramen promotes overfilling. Some authors, like Kvinnsland et al. (2010) and Rafter (2005), state that the dental papilla may simulate an apical periodontitis in the area of the open apical foramen.

Various methods favouring maturation of the immature teeth are described. Surgical interventions turned out to be less promising (Kreter 1959, Khoury 1992). Herforth (1981) obtained a very high healing rate of apical periodontitis with Jodoform deposits, however the success rate regarding stimulation of hard tissue induction only amounted to 3 % versus 83 % with calcium hydroxide ($Ca(OH)_2$). Hermann (1920, 1930) introduced calcium hydroxide as material with osteogenic potential. Frank (1966) was the first to use it as medical dressing in teeth with incomplete root growth. These dressings should be replaced approx. every three months for a time period of six through 18 months. Cvek (1972) and Feiglin (1985), however, do favour a replacement of the dressing only in case of pathology. The long treatment duration—and thus loss of patient compliance—as well as a decrease of fracture resistance (Cvek 1972, Andreasen, Fabrik and Munksgaard 2002, Andreasen, Munksgaard and Bakland 2006, Trope 2006) are regarded as adverse features of the calcium hydroxide method.

As formaldehyde also features an osteogenic potential (Orban 1935), tests with formocresol versus calcium hydroxide were made as well. Within a pulpotomy study, Spedding et al. (1965) judged formocresol as being more appropriate for apexification. Latest literature prefers mineral trioxide aggregate (MTA) over calcium hydroxide (Andreasen et al. 2006, Schwartz et al. 2008, Schäfer 2003, 2004). Shabahang et al. (1999) as well as ElMeligy et al. (2006) made a comparison between mineral trioxide aggregate and calcium hydroxide ending up in favour of MTA.

In a prospective study, Simon et al. (2007) report on 43 one-stage MTA treatments, which were followed up after a control period of at least 12 months (up to 36): 65 % of apical lesions were completely healed and an apical barrier could be observed in 11 cases (26 %). 78.7% were free from apical periodontitis, whereas apexification took place in only 64 out of 75 cases (85.3 %). The time period for control of apical development was clearly longer, though, amounting to 70 months.

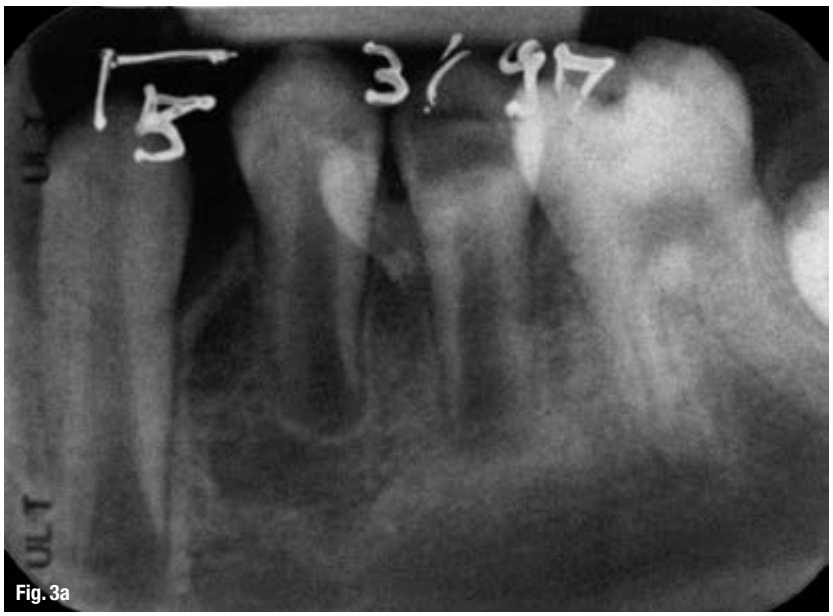

Fig. 3a

Case 1: Male (born 5 June 1987): Tooth 35
Fig. 3a: 18 March 1997 ante pulpotomy.
Fig. 3b: 18 March 1997 post pulpotomy.
Fig. 3c: 6 May 2005 status.

Aside from the therapy with various medicaments, the 'revascularization' therapy was established also (Ham et al. 1972, Hülsmann et al. 2008, Bose et al. 2009, Cehreli et al. 2012, Garcia-Gody and Murray 2011) provoking a light bleeding into the pulp by punction beyond the apex. Dressing is placed coronary: MTA, calcium hydroxide, formocresol or a triple antibiotic paste. The latter one provided thicker canal walls than calcium hydroxide respectively formocresol. Also the length growth was stronger versus MTA application (Ebeleseder 2004).

Based on the knowledge that formaldehyde preparations have a similar (necrotizing, osteogenic) effect to the pulp like calcium hydroxide, the secondary author of this study as long-time owner of a general dental practice suggested an analysis of his endodontic treatment cases with open apical foramen regarding apexification/apexogenesis, which had been carried out by Joschko (2013) as then doctoral candidate from which this article reports.

Material and method

99 endodontic treatments of teeth with open apical foramen were taken from the files of the practice examined in this study in the years 1985 through 2006. Treatment method was the so-called N2 method according to Sargenti and Richter(1954), which meant: no canal rinsing and application of the paraformaldehyde-containing N2. Rubberdam was not used. The N2 powder contained 7 % formaldehyde before admission by the EU, afterwards the content was decreased to 5 %.

Four cases were excluded:

- A non-vital case where the initial X-ray did not clearly reveal whether the apical radiolucency of both roots were a matter of apical periodontitis or apical papilla.
- A VitA-case was extracted alio loco a few days up to 18 months after VitA.
- X-ray was insufficient in the third case, VitE of an upper molar
- In the fourth case, the patient did not show up again after devitalization of an upper premolar.

Thus, 95 cases to be judged remained, of which only two non-vital teeth were treated in a two-stage therapy. 93 cases were treated in one appointment inclusive definite filling. For root canal filling, the N2 powder was mixed with N2 liquid to a creamy texture, a harder consistency was needed for VitA. N2 application for root canal filling was done by lentulo, for VitA a carrier instrument was used to bring the material into the excavated pulp cavity up to 1–2 mm into the canal accesses.

The 95 anonymous made cases were clinically followed-up without recall at an average of 73 months after treatment. 75 cases underwent X-ray control (follow-up X-ray) after an average of 70 months; 64 cases as single-tooth X-ray in parallel technique and 11 cases as orthopantomogram.

Fig. 3b

Fig. 3c

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