

# **The Evolution of Surgical Endodontics: Never and Always**

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### **Introduction**

This paper came out of discussions with Hu-Friedy as we were developing new materials describing the Marwan Abou-Rass, or “MAR” microsurgical endodontic instrument line. Since I have been teaching, conducting research and performing microsurgical endodontics for many years, Hu-Friedy was interested in my perspective on the evolution of the specialty, and what the future might hold. I tried to fit it all in the sales brochure we were working on, but how can one compress decades of change into a few short paragraphs? Hence, we decided to make it a separate venture.

Since graduating from dental school and completing my endodontic training, I have been immersed in university environments where dialog regarding best practices in endodontics can be collaborative, and sometimes heated -- because my academic and clinical peers are passionate about what we do.

Throughout my career I have collaborated with many global peers who have combined innovation and critical thinking with willingness to risk being “wrong”. As a result, the profession has made significant advances for which we have all benefited. It is for them that I dedicate this paper.

This paper outlines my perspective on how microsurgical endodontics has progressed over several decades, from its infancy in the 1940s, through developments which have shaped the practice today. I conclude with “educated guesses” regarding what the future may hold.

### **I. The Influence of Oral Surgery Period**

In the 1940s, endodontic surgery was often performed by oral surgeons, adapting their methods and instruments used for oral surgery. While honorable, at times they did not understand that their methods of flap design, canal retreatment and apical retrofillings, often lead to delayed healing, tissue scarring, patient pain and an overall negative patient experience – nor did most Endodontists, as the surgical aspect of the specialty was in its infancy.

Indeed, from the 1940s until the 1970s, endodontic surgery was often performed in oral surgery resident program clinics, and supervised by its faculty. Oral surgery concepts of the “focal infection era” emphasized the removal of the tooth and its “infected” supporting bone. In sharp contrast, endodontics and periodontics emphasized the preservation of the tooth, and its supporting hard and soft tissue. While operating with the best of intentions, oral surgeons of that era seemed unaware that tooth removal and tooth preservation were in inherent conflict with one another. Oral surgeons were performing apicoectomies on failing sub-standard endodontic treatments without considering canal retreatment or the placement of apical retro-filling.

Writing in 1981, the late Professor Donald Arens et al suggested that most information available on endodontic surgery was written by oral surgeons with limited endodontic background (1), thus suggesting that the influence of the oral surgeon remained prevalent well beyond the 1970s.

In 1991, Guttman and Harrison concluded that many of the teachings of endodontic surgery in the “oral surgery” period espoused concepts and techniques that might not be applicable to endodontic surgery and could prove to

be counter-productive(2). For example, the triangular flap design -- the most recommended flap design in oral surgery – for apical endodontics, even though this is not the ideal design for apical applications because the vertical incision component of the triangular flap can cause the loss of the gingival inter-dental papillae if the incision bisects the papillae. This flap design can also cause infection, delayed healing, soft tissue dehiscence or alveolar bone fenestration if the vertical incision is placed unknowingly over large cortical alveolar bone defect.

The semi lunar flap design also has its roots in oral surgery and dominated endodontic surgery for decades. Although the semi lunar flap design may allow the surgeon to perform the indicated apical resection, it has these drawbacks:

- Restricted surgical access
- Poor visibility of the surgical site
- Excessive trauma to the fragile mucosal component of the flap
- Severance of the vertical supra-periosteal blood vessels of the attached gingival component of the flap
- Suture loss and wound infection because of frena and mucosal vestibule movements
- And most importantly, a lack of the clinician's ability to visualize and examine the cervical areas of the tooth structure or the marginal gingivae and periodontal tissue

These clinical and biological shortcomings were often paid for with delayed healing, tissue scarring, pain, negative personal experience and fear of undergoing another endodontic surgery. Quite the opposite results one would hope for.

## **II. The "Never Surgery" and "Always Surgery" Period**

According to Frank et al 1983 (3) the period of the 1940s through the 1970s can be characterized by two conflicting schools of thought: "Always surgery" or "never surgery". In the former, surgery was performed to remove periapical pathosis after every root canal treatment. "Surgery was used promiscuously as a corrective technique following an inadequate therapy" according to Frank et al(3). For example, gross endodontic over-fill caused by the combined errors of inaccurate root length measurement and apical perforation led to apical curettage and apicoectomy to remove the over-fill.

The specialty continued to be influenced by oral surgery techniques during this time. For example, in order to save esthetic and strategic restorations on teeth diseased with primary periapical pathology, patients were often referred to the oral surgeon or the endodontist with a prescription for apical retro-fillings instead of standard endodontic treatment or apicoectomy on teeth with endodontic failures. A practice that saved the tooth, kept the restoration intact and the referred dentist and the patient happy but was not the proper treatment to do, as time revealed.

On the other hand the "never surgery" school believed surgery should never be done and postulated, (perhaps stubbornly) that all endodontic procedural errors should be corrected thru the canal, regardless of the length of time needed, operator skill, and the risks involved. Others in this school used the tooth proximity to critical anatomy to contraindicate surgery. Surgery on maxillary molars was avoided because of fear of maxillary sinus exposure. Surgery on mandibular molars was avoided because of fear of damaging the inferior alveolar or the mental nerve. Contraindications, that anatomy and clinical practice proved them to be mere claims and unsupported contentions.

Ultimately, the “never surgery” philosophy gave rise to a “wait and see” approach or “let us watch it” practice, where periodic recall protocols, replaced standard endodontic re-treatment of teeth with substandard endodontic treatment. Furthermore, procedural errors such as short fills, over fills, untreated canals, perforations, fractured instruments were placed on periodic 6-12 month recall protocol where the problem tooth was examined clinically and radiographically. No serious attempts to correct the problem through retreatment or endodontic surgery was recommended until the patient developed symptoms such as pain, swelling, tooth mobility, fistula formation, and pus drainage or lesion formation Abou-Rass (4).

To rationalize their “never surgery” philosophy some clinicians considered asymptomatic small apical radiolucencies, as apical scars. Fractured endodontic instruments within the canal were accepted as root canal fillings and canal calcifications were considered as “natural” physiologic fillings. Another set of justifications that biology and research ultimately proved wrong.

The contradictions between “never and always” were merely another step in the evolution of the specialty. Practitioners, whether oral surgeons or Endodontists did what they thought was right based on the knowledge they had at that time. Just as in time as endodontics continues to evolve, current day practices will no doubt be viewed with reservations – again due to the normal evolution of the specialty.

### **III. The Current Period: Research, Biology and Technology**

In the 1990s, results of the “wait and see” philosophy in oral and dental health care became better understood.

Periapical lesions tend to extend cervical to combine with periodontal pockets and periradicular defects thus destroying all the apical and buccal bone needed for implant placement. The bone and gingival soft tissue was lost because of the “never surgery”, and the “wait and see” approach gave way to make dental implant therapy possible but often at a huge costs, monetary and otherwise.

Time consuming, costly and complex guided bone regeneration, guided tissue regeneration and maxillary sinus lift surgeries using synthetic, or bovine bone and pig skin membranes have to be used now to replace or regenerate the bone and tissue lost due to “wait and see” or “never surgery”. Had a more holistic approach embracing surgical options been in place, patients and practitioners in this situation would find themselves with more options to choose from.

Since the beginning, Implantology showed the Dental profession the value of alveolar bone and the costly biologic and economic price of early tooth loss or removal. The fundamental goal of dentistry is to “save the tooth” and to ensure patients, regardless of wealth, are taught about the importance of dental care, not only as it relates to healthy teeth, gingivae and the like, but also the overall health of every individual. Implantology has gone through its own growing pains – just like the other dental specialties – and provides millions with an option that is relatively new compared to many other specialties – an option that many people can benefit greatly by.

However, it is time for the endodontic profession to come together and realize that surgical and nonsurgical endodontics and periodontics are the treatment of choice to preserve and regenerate the alveolar bone, both in healthy and diseased environments Abou-Rass (5). Implantology is an option that fits right into this continuum – when the situation warrants that approach.

Today surgical Endodontics is coming to its own, like many of the other dental specialties; biological principles and research evidence are being incorporated in everyday's practice endodontic surgery. This evolution has benefited greatly by technology.

The operative surgical microscope introduced by Carr in 1992 (6) and the ergonomics of its usage in endodontic surgery led by Niemczk, in 2009 (7) and others have had a great impact on apical results. Today the surgical microscope and surgical loupes are an integral part of the modern endodontic surgery armamentarium. They provide better illumination and magnification to visualize the complex and delicate gingival intra-sulcular and inter-dental papillae anatomy and the intricate root apex isthmuses, unexpected root abnormal anatomy, lateral canals, perforations and crack lines. They help us "do our job better".

The introduction of small equipment such as ultrasonic filling tips, apex locaters, rotary files and other new technological advances have also helps us "do our job better". The ultrasonic retro-tips introduced by Carr 1992 (6) and Engel (8) et al in 1995, replaced the rigid iatrogenic oversized round burs, helping to significantly minimize or prevent large retro-filling preparations and perforations.

Retro mirrors, like those offered by Hu-Friedy also offer the surgeon a better and more accurate view of the root end. MTA developed by Torabinejad et al (9) has had another positive impact as research found it to be superior to the alloys and more biologic retro fill materials commonly used. The apical bevel thru slightly overfilled and well packed gutta-percha filling can eliminate the need for retrofilling altogether, thus saving the time, potential errors, and stress associated with the execution of the seven operative steps required in doing an apical retrofilling

Systematic studies that offer evidence-based clinical guidelines, and statistical results comparisons between the traditional and microsurgical endodontic surgery all contribute to one thing: making better choices for clinical success (See Kim and Kratchman et. al (10) Tesis (11)). New clinical techniques related to esthetic and biologic soft tissue management developed by many researchers but especially von Arx et al (12) and Velvart and Peters (13) have had a solid and positive impact on surgical outcomes – and the field of dentistry in general.

Today therapeutic, exploratory or prophylactic indications embrace surgical approaches and incorporate the thinking behind "Treatment Finalization" which I developed years ago in collaboration with many, of my peers Abou-Rass (4). The concept of extending care beyond performing a simple root canal to include other factors that impact success many not seem novel now, but at the time this concept was developed it was met with both acceptance and rejection. This "holistic" approach has many preventive and conservative merits; avoiding bone loss, critical size osseous defect formation, tooth extraction and its negative impact on the alveolar ridge height and width.

At a broader level, preventing declining oral and dental health, and its impact on total health calls for a holistic approach. At times and the need for prosthesis or dental implants will be the option of choice based on clinical evaluation, but hopefully a choice made by circumstances beyond the clinician's control, and not because of it. The "wait and see" approach should be rarely advised. Instead, "open and see", should reign -- for both preservation and extended oral health.

#### **IV. The Future**

The current technological advances and the applications of research and biological principles in non-surgical and surgical Endodontic treatment will continue throughout the 21st century. As to the future of Endodontics I will discuss it from two aspects, Endodontic education and Endodontic practice. The future of Endodontic specialty will

depend largely on the Endodontic educators. Teaching requires a professional full time commitment. The shortage of qualified, clinically competent, biologically and research oriented, full time educators is having negative impact on the Endodontic specialty. On the undergraduate Endodontic and continuing education levels we should emphasize that there is more to Endodontics than the techniques of root canal preparation and obturation. On the advanced Endodontic education level there should be more emphasis on the preparation of endodontic educators and surgically competent clinicians.

As to the future of Endodontic practice, we hear wrong comparisons on Endodontic vs. Implant treatments. Such comparisons will disappear as the definition and management of dental Implant failures and peri-implantitis become more definite. **They say history repeat itself, I think it will.** So let us look in dental patient care in the 70s, 80s and 90s.

Dental treatment such as: Endodontic treatments and re-treatments, apical curettage, apicoectomy and retro-filing, crown lengthening, hemisection, root amputation, SRP, curettage, osseous surgery, esthetic periodontal surgery, GTR, GBR, Orthodontic molar uprighting and extrusion. These treatments followed by proper post and restoration have had proven themselves as time-honored, predictable and successful treatments and have saved the teeth of millions of patients throughout the globe. The problem is that many of today's dentists have not been taught, experienced or seen the benefits of such treatments.

Implant dentistry had showed us the importance of alveolar bone and the role of teeth in preserving it. The literature shows the disastrous effects of tooth loss on the alveolar bone. Today we know that when we save teeth, we save alveolar bone. And when we save alveolar bone, we save facial musculature, we save youth and prevent the early aging look. Implant dentistry goal was never the replacement of teeth. Endodontics, periodontics and restorative dentistry is the core of preventive dentistry and what dentistry is all about. Implant dentistry is just one part of this continuum.

### **Closing**

The role of dental educators and researchers is to continually innovate and educate. To create and simplify protocols. Then go back and advance the specialty again through new discoveries. It is exciting to watch the specialty progress. Clinicians are better trained, Endodontic surgery times are shorter, complications fewer, and successes greater. I am honored to have a part in enhancing the quality of life by advancing the endodontic profession.

A handwritten signature in black ink, appearing to read "Marwan Abou-Rass". The signature is fluid and cursive, with a prominent initial "M".

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### **About Professor Marwan Abou-Rass**

Professor Marwan Abou-Rass is Professor Emeritus at the University of Southern California, School of Dentistry where he served as Department Chairman and Director of Advanced Endodontics from 1972–1998. He also served as Director of Prince Abdul Rahman Advanced Dental Institute (PAADI) Riyadh, Saudi Arabia from 1998–2013.

As an educator and clinician with formal specialty training in fixed Prosthodontics and Endodontics, Dr. Abou-Rass has witnessed and participated in the evolution of the current trends and concepts in microsurgical endodontics. Today's Endodontists are better trained and biologically oriented with better surgical outcomes and fewer complications.

Dr. Abou-Rass continues to make significant contributions to endodontic research, education, and clinical practice.

For more information and contact with Professor Abou-Rass, including a more in-depth discussion of historical endodontic trends visit [AbouRass.com](http://AbouRass.com), [Hu-Friedy.com](http://Hu-Friedy.com), [dr.abourass@gmail.com](mailto:dr.abourass@gmail.com) and [abourass@usc.edu](mailto:abourass@usc.edu).