Do Dental Implants Fail 10 Times More than Natural Teeth?

A Critical Review and Related Commentary

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Overly grandiose and poorly substantiated titles risk the take-away message that Dental Implants don't work, *as the "casual" reader may not investigate beyond the title and critically analyze the full publication. Such a conclusion could prevent dentists from considering dental implants as part of many viable treatment options that could benefit their patients. On the other hand, one may argue that this message may reduce the overly aggressive removal of natural teeth and bone in favor of replacement with Dental Implants. The purpose of this submission is to review the featured publications by Froum and Guarnieri et al. with the aim of providing a responsible critical analysis.*

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"Dental implants fail at a rate 10 times that of natural teeth in patients with treated chronic periodontitis: New study". *"Before you place that implant, read what Dr. Scott Froum says about the longevity of implants…"* in "PERIO-IMPLANT ADVISORY," April 2, 2021, by Dr. Scott Froum

The above words introduce a "commentary" following the 2021 publication: **"Longevity of Teeth and Dental Implants in Patients Treated for Chronic Periodontitis Following Periodontal Maintenance Therapy in a Private Specialist Practice: A Retrospective Study with a 10-Year Follow-up",** Guarnieri R. et al., in the Int J Periodontics Restorative Dent 2021;41:89-98.

The study by Guarnieri et al.[2], 2021, appears to be Dr. Froum's source for his title. Even reading the Guarnieri abstract might have been sufficient to reduce Dr. Froum's claim that implants have 10 times the failure rate of periodontally involved teeth to 5.7 times. However, please don't use that figure either. There are difficulties in calculating the relative failure rate of dental implants and teeth, especially when the dental implants are of undisclosed origin and are installed at various times into a mouth sickened with chronic moderate to severe periodontitis. This environment is usually laden with oral pathogens that have demonstrated their ability to cause tissue destruction and are deemed inhospitable for dental implants.

Why did Dr. Froum not include or discuss the loss of periodontally involved teeth that failed due to caries, root canal problems and other complications to which

dental implants are immune? Indeed, using dental implants between teeth can improve the prognosis of those teeth by saving them from trauma related to restorative efforts and additional loading by an enlarged prosthesis. These are real-life considerations of a conscientious clinician devising a treatment plan for a patient.

Dr. Froum is a periodontist and teacher. As such, he may have written this article to focus the debate on the retention of teeth. He may be voicing his concern regarding dentists who plan treatments that others regard as overly aggressive. Some of these treatments involve the removal of volumes of supporting tissues and many relatively healthy teeth. Some of these full-arch "teeth in a day" treatments appear risky. (Fig 1) Dentists delivering such treatment must believe their implant treatment will be better without remaining teeth. Who suffers the most when the dentist is wrong?

Fig 1: Picture from the internet showing extensive removal of tissue to prepare the patient for all-on-X implant placement and immediate restoration

However, without discussing such possible intents of an article, there is always the danger of misleading clinicians. Misled clinicians can do severe damage to patients. Before being swayed by such grandiose claims, the serious clinician needs to dig a little deeper and carefully investigate its references, including the research results of Dr. Guarnieri.

Review of Guarnieri et al.[2] Article: Longevity of teeth and Dental Implants Treated for Chronic Periodontitis Following Periodontal Maintenance Therapy in a Private Specialist practice: A Retrospective Study with a 10-Year Follow-up.

Unlike the Froum article, the above title is more descriptive of the study contents and is without grandiose claims. It represents an impressive effort by the authors to do such extensive research in a Private Practice setting. The authors included many metrics in the data analysis to optimize the standardization of definitions, controls, and results.

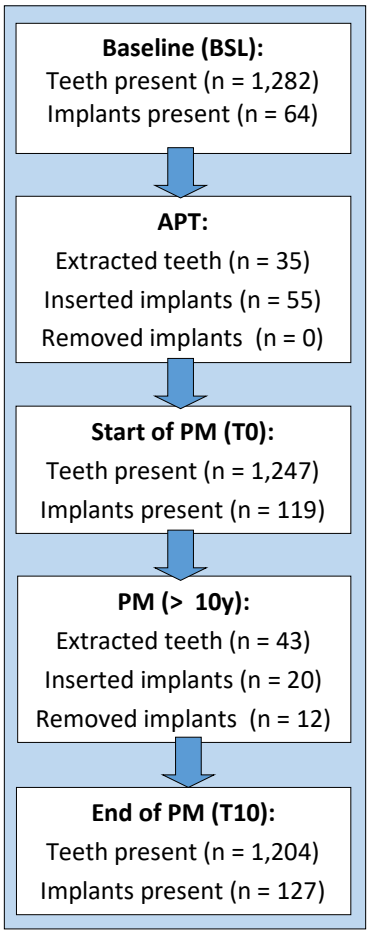

Fig 2: Guarnieri's Appendix Fig 1 shows the numbers involved in his study.

The authors face several inherent difficulties as they try to make sense of the data related to their small heterogenous group of patients. They acknowledge the weakness of their small sample size (58 patients) and that this study is a single private practice retrospective study. Indeed, retrospective studies with only one person doing the treatment and evaluation are more highly subject to "bias." We do not know the degree of scrutiny the Int J of Perio and Rest Dent has concerning "bias."

Dr. Guarnieri combined 64 implants existing before APT (Active Periodontal Treatment) with the 55 implants he placed during APT in his 10-year follow-up statistics. (Fig 2) There was no indication of the length of time these 64 existing implants were in the mouth before ATP or who placed them. We understand that implant failure does increase over time[3] and thus may have biased the data towards a higher implant failure rate.

The Arlin study[3] overlaps the period of the Guarnieri study. Dr. Arlin would have preferred to know more details about the 12 implant failures regarding their design and the nature of their surfaces. There were no such descriptions. Dr. Arlin would have liked to see if any failed implants utilized **HA or TPS surfaces.** These are associated with more "late" failures'. For example, in Dr. Arlin's Dec. 2020 "career paper", if you look at page 46, Table 20 shows my 268 HA Core-Vent implants showing many "late" failures with a "Survival" and "Cumulative Survival" rate at the 19-20 year follow-up period of **80.2% and 75.9%** respectively. It is essential to know whether these dental implant brands with a higher failure rate are in the Guarnieri study. If these high failure implants are included in this study, these might have biased the results towards a higher implant failure rate. The Straumann TPS fared better, while the Nobel Replace TPS fared worse.

Further to the above consideration, even though many teeth were in this article, only a few implants failed. **It is risky to extrapolate results from the failure of only 12 implants out of 127**. Indeed, this 10 percent failure rate over an unknown number of years, greater than 10, can be pretty good and, as stated in the article, comparable to others. In any case, using percentages and other metrics that disguise the fact that only 12 implants are lost over 10 years is akin to making a mountain out of a molehill.

The author did not seem to consistently use the correct terms "survival" vs. "success" and "cumulative rate" vs "absolute or current rate"? There was no "Life-Tables" presented! It would have been illuminating to see the full Life-Tables follow-up periods for the 64 and 55 implant groups. Surprisingly, patients with moderate to severe chronic periodontitis had no implant failures in the 0-5 year follow-up period. According to the Arlin study[3], one might expect a significant percentage of "early" implant failures.

Some of the numbers don't seem to add up. For example, there were 1,247 teeth after ATP (Appendix Fig 1)[2]. 43 teeth were extracted during the ten-year follow-up period, and Guarnieri states there was a 90% tooth survival rate. We seem to calculate a 96.55% "absolute survival rate." Perhaps he also added in the 5.8% hopeless teeth ((70 + 43 = 113) / 1204) at T10 to achieve a 94% survival rate for teeth. We don't know how he calculated a 90% survival rate for teeth. However, we have 90-94% survival of teeth and 90% of implants surviving over the 10 years. That is certainly not tooth survival 10X that of implant survival. It looks like a similar survival rate for implants and teeth in a diseased environment.

On page 93, "35 hopeless teeth were removed and preliminary treatment rendered to clean things up. **At time zero** (T0), **6.7%**, 27.3% and 65.9% of the teeth were classified as **hopeless**, questionable, and good, respectively." So, according to **Appendix Fig 1,** 6.7% of the remaining 1247 or 84 teeth are still in the hopeless cate-

gory at T0. Why were they not extracted? I would expect these sick teeth to be the first to fail and be removed during the study period.

The researchers did not use grafting techniques to prepare extraction sites for implant placement. The new implants would likely go into non-ideal areas. These may be deficient in volume due to anatomic considerations, non-ideal due to sclerosing of bone adjacent to chronically infected teeth and have a high inoculum of oral pathogens. The existing oral pathogens have already shown their ability to overcome the host's immune defences. These conditions are all non-ideal for the survival of dental implants.

Guarnieri provided no information regarding the risk factors for peri-implantitis inherent to the systems used to attach teeth to the dental implants. This information is lacking and makes the conclusions more difficult to interpret. Did the crowns and bridges attached to the implants expose the patients to implant-abutment misfits, open margins, or subgingival cement? These are all risk factors for peri-implantitis. (Fig 3)

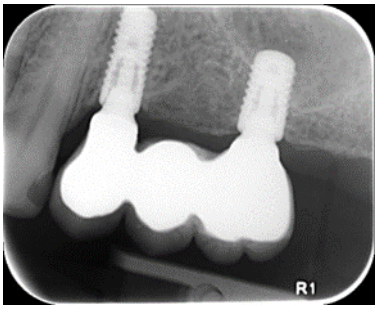

Fig 3: Implant on left demonstrates an implant-abutment misfit.

Dr. Guarnieri uses dental implants to replace failed teeth, despite coexisting chronic moderate to severe periodontitis. At the end of treatment after 10 years (T10), there were 1204 teeth present, with 5.8% of them deemed hopeless. That means the remaining 58 patients face the loss of another 70 teeth. What now? The clinician will need to manage the problem of placing even more implants into an increasingly hostile environment, as the tissues around the failed teeth are now gone.

For the sake of this study, Guarnieri might have pushed the threshold for tooth retention towards the extreme. He claims that some of the remaining severely infected teeth got better over the time of his experiment. When one removes the bad teeth from the mouth, the remaining teeth will appear to have improved. In the case shown in his Fig 4, the improvement of bone levels around some remaining teeth is evident. Perhaps, Dr. Guarnieri may have retained more teeth than practical. However, if his patients demanded that their teeth be maintained regardless of cost and time, their treatment might be considered acceptable.

Svoboda ELA and Arlin M: There are many reasons to remove teeth. They may be in the wrong position, they may be non-restorable, or they may have chronic severe periodontitis. In addition to the above, they may occupy key positions for implant placement. Clearly, with periodontally involved teeth, waiting until all the periodontal disease has destroyed the remaining soft and hard tissues may not be the best approach.

It is still distressing to see reasonably good teeth and bone removed for an expedited treatment approach that hangs all the teeth together on a few implants. (Fig 1)

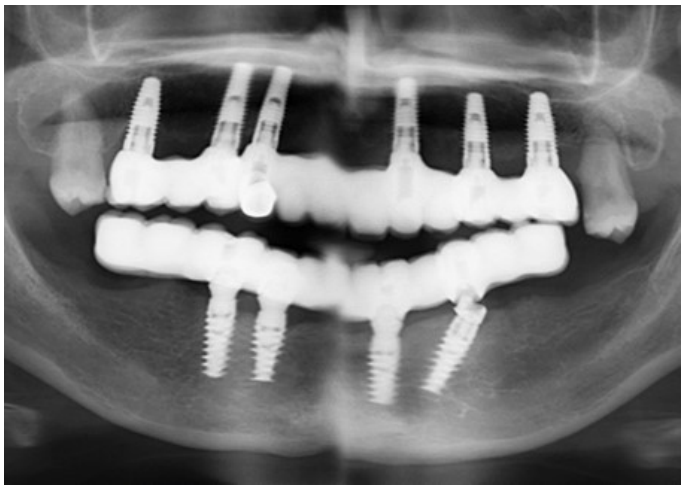

Fig 4: Implant on right demonstrates a large abutment-prosthesis connector misfit.

The long-term success of such prosthetics is also not that good, and it often leaves bone in the posterior free of implants, only to see it lost over time. Reconstruction of such failed cases can be expensive, and the patients who are now older may not have the funds or health to manage the rehabilitation processes. Perhaps it is essential to discuss success rates rather than survival rates of implants with such patients and mention the expected 10-year survival of full mouth prosthetics to be about 65%.[3]

Fig 5: Imagine the width of the prosthesis that will be retained by these implants to support the lips and align with the mandibular teeth. Poor access to care and abutment-prosthesis misfits guaranteed!

Indeed, it is also distressing to know that 100% of the full-mouth prosthetics installed by the screw-in technique subject the patient to risk factors for peri-implant disease. These risk

factors include abutment-prosthesis misfits, abutment-prosthetic connector misfits, (Fig 4) and poor access to care. (Fig 5) This latter problem results from using bulky prosthetic material to compensate for the hard and soft tissues removed for esthetic reasons. Imagine removing all that tissue (Fig 1) to hide the gingival-prosthetic line. Perhaps, with a little more effort, we can interface with the remaining tissues and get adequate esthetics. Are the consequences of all that tissue removal adequately discussed with the patient?

Fig 6: This is a case with 6 zygomatic implants and 4 mandibular implants. What about the misfit joints, and poor access to care. Why no implants in the posterior mandible and a segmented prosthesis?

We understand that a splinted prosthesis may be necessary to facilitate osseointegration of immediate implants during the initial healing period. (Fig 6) Why can we not plan to segment the final prosthesis after the implants integrate?

Perhaps a review of the risk factors for peri-implant disease[4] , and how to optimize the fit of implant parts[5-7] might help clinicians provide even better treatment for their patients.

Conclusions: The research by Guarnieri makes it challenging to compare the survival rate of implants and teeth receiving treatment for chronic moderate to severe periodontitis. Dr. Froum's statement that such sick teeth have 10 times the survival rate of dental implants is misleading and unsubstantiated.

The astute clinician is encouraged to dig a little deeper to evaluate the evidence that supports the treatment they wish to perform for their patients. Our knowledge base is forever changing. Thus, it takes time and effort to keep up and provide our patients with up-to-date information regarding their treatment options and to make their treatment as safe as possible.

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