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The Need of Introducing the Intent-To-Treat (ITT) Concept in Oral Implantology - Narrative Review

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Abstract:

The authors propose and justify the application of the Intention-to-treat (ITT) principle in the field of oral implantology. The principle states that all participants participating in a clinical trial analysis should be analyzed in their originally assigned treatment groups (treatment and control groups), regardless of whether they completed their treatment, experienced challenging events, or withdrew from the study.

The ITT concept has (astonishingly) not been applied in conventional oral implantology so far, although it would provide a more realistic assessment on the usefulness and effectiveness of specific oral implant procedures for the general public. It was concluded that the ITT principle is an effective and conservative approach in evaluating treatment benefits, as it allows the inclusion of all participants, even those that failed to adhere to the treatment.

The ITT principle also addresses missing data by deploying imputation technique to account for missing data points. Notably, the application of ITT analysis in the clinical aspects of implantology is vital because it provides insights into the efficacy of a dental implant procedure under real life conditions. As reports that include data for this important principle were never published in the field of conventional oral implantology during the last 30 years, the pattern of reporting was presumably centrally dictated by one or more interest groups.

Keywords:

ITT Principle; osseointegration; osseofixation; patient selection; treatment group; incomplete publications on osseointegrated implants.

1. Introduction

In the 21st century, when a dental patient asks their doctor about the best treatment option, we need to remember two things. First, we should deliver a comprehensive treatment plan that includes all available strategies. Second, we must provide a reliable and unbiased evaluation of the effectiveness of the discussed treatment methods. However, how do we choose the most credible options amidst the vast amount of scientific research? The most popular approach is to use randomized controlled trials (RCTs). Pragmatic RCTs are particularly useful because, in contrast to explanatory RCTs, they focus on the real-world effectiveness of interventions.[1]

However, even RCTs are dependent on participants on both sides: the operator with their skill and knowledge, and the patients with their diversity in general health and bone conditions. Like human nature, RCTs are not flawless. Because participants are likely to deviate from the treatment strategy for various reasons, they can compromise the validity of the study by nullifying the advantages of randomization.[2] For this reason, the intention-to-treat (ITT) concept was introduced. The ITT analysis is mandatory in randomized clinical trials[3-5].

Surprisingly, while this principle is well accepted in general medicine, it has never been applied in the field of conventional oral implantology.[6]

The ITT principle reduces bias by ensuring that all patients are incorporated in a treatment group. Thus, during the assessment of the effectiveness of any given implant system, all patients should be followed, including those that received the treatment and those that did not.[7, 8]

As oral implantology has proliferated in the last 20 to 30 years, an increasing number of patients have been considering replacing missing teeth with implants.[9-11]

Patients who deny the treatment for whatever reason and those who were selected but left untreated are not included in the statistics regarding efficiency of the oral implantology worldwide.[12-14]

This creates the false belief about the effectiveness of different implant systems.

Patients requesting dental implants may not receive them for a number of reasons: the treatment provider selects them

out because of their general health conditions, local availability of bone and habits[15]. This usually occurs in patients with morbidities like diabetes, osteoporosis, hypertension etc. Smokers, alcohol and drug abusers as well as patients with severe bone atrophy are typically excluded from treatments with conventional implants[16, 17]. Such patients will be filtered out through the process of **"patient selection"** and not included in statistics. Another reason for not undergoing the proposed treatment is the fact that some patients, after consultation, decide that under the conditions offered by the treatment provider (e.g. extensive bone grafts), they would rather reject implant treatment. The lack of reporting those patients leaves a big gap of information in the field or oral implantology, because the existing studies do not reflect the real-life applicability and effectiveness (especially in the age group of the elderly) for the method of implant treatment and osseointegration.

The aim of this article is to familiarize both practitioners and researchers in the field of oral implants with the ITT concept and to propose a timepoint when an inclusion of a patient into the cohort of patients treated has to be done. This will allow for a broader view of the treatment options and effectiveness evaluation of dental implants. It will ultimately significantly improve our understanding of different implant system applications and clarify misunderstandings in oral implantology.

2. Problem Statement

Various RCT studies have been conducted regarding dental implants, but almost none of the studies applied the ITT principle. Furthermore, only few studies focused on the clinical reliability of inclusion/exclusion criteria. However, hard data regarding the number of deselected patients has not been found in the available literature on conventional implantology. If we take into account that some implant solutions like subperiosteal, zygomatic or disc implants are not the first choice in good bone conditions but are only recommended if standard protocols are not an option anymore. It is clearly visible that our view of the uncommon implant system effectiveness is lacking. Additionally, if in the RCT study results, it is not known how many participants did not receive the primary interventions to

which they were randomized, changed trial arms, missed appointments, or dropped out, the conclusions may lead to false clinical importance. For instance, Lazarov evaluated a protocol for immediate functional loading of one-piece cortical implants where he claimed that patient selection was not necessary as the only inclusion criteria was the presence of second cortical bone.[18] In his study, all patients who requested implants had been treated without exception.

Such a study design, although it may seem risky from a clinical point of view, allows for drawing real conclusions regarding the applicability of the chosen implant system. Apart from the study by Lazarov, no studies applying specific clinical aspects of the ITT principle in oral implantology have been found. Therefore, applying the presented principle would fill this gap by determining the number of patients deciding for or against implant treatment and their reasons for making such a decision.

3. Discussion

Since 1961, when ITT analysis was first introduced by Sir Austin Bradford Hill, who observed that the exclusion of subjects after randomization could compromise a study's validity[5], researchers have continued to face significant challenges with its proper application. In an ideal scenario for ITT, all collected data should be used in the analysis. This approach preserves the benefits of the randomization process, as well as the sample size, statistical power, and comparability between groups, ultimately helping to minimize bias.[2] This section presents a few examples that would explain why the application of the ITT principle is imperative in all fields of medicine and especially in oral implantology, as it allows clinical trials to be analyzed effectively and maintains the integrity of the randomization process.[19]

The ITT principle ensures that clinical trial results are analyzed according to the patient's initial allocation to a study group. It analyzes all subjects included in the study based on their initial randomization, regardless of any deviations from the protocol. This means if a patient receives an implant consultation in a clinic, their case will be included into the statistics of that particular clinic regardless of whether the treatment takes place there or not.

3.1 Randomized Controlled Trials (RCT)

Is the RCT in oral implantology really the **"gold standard"** and should the study conditions not be standardized and strictly controlled? Would RCT be the right choice when it comes to comparing any brand of conventional implants on one side and any alternative system like for example one-piece implants on the other side? Especially if they utilize different loading protocols and bone anchorage.[20-23]

As we know, one-piece implants with polished surface do not depend on osseointegration (OI) for primary stabilization, as this requires time to develop.[24] Instead, they utilize bone compression and locate the implant threads in highly mineralized cortical bone that can be found as the outer layer of the bones.[25] The latter is called osseofixation (OF).[26, 27]

If patients are randomly assigned to the OI or the OF group, all patients in the OF group will receive treatments as planned and their outcome will be monitored. Nobody would be excluded, although some patients might refuse treatment. In the OI group, however, many patients would be untreatable without bone transplant, bone augmentation or sinus-lift procedures.[28] Many patients in this group would either refuse these accessory treatments or postpone the oral implant treatment as much as possible. Patients also compare the price of the treatment: with the price of implants being identical, the treatment which includes bone augmentation and intermediate prosthetic solutions (i.e. removable dentures) would still be significantly more expensive, which reduces the chance to become the method of choice for many patients. However, even if the randomization would work, uncountable patients who are randomly assigned to the OI group could be not eligible for treatment that includes bone augmentation, healing times and intermediate prosthetic steps. They would be rejected and referred to the other group working with the OF method. This would result in the creation of a **"subgroup"** of a significant size that receives exactly the same treatment as the control group (because nothing else can be done in such cases). Successful treatment of patients who switch groups would be counted as a success in their original group. Hence, such a comparative study makes no sense.

3.2 Cohort Study

A **"cohort study"** in OI implantology demands that each subsequent case is entered into a study. Cases should be included after patients have received a personal consultation by a qualified physician. Patients who have been excluded (or have been denied treatment for various reasons) must remain part of the cohort, even if they are not treated (e.g. because their medical status caused their treatment with conventional oral implants to be contraindicated).

A patient with a complicated bone fracture of the lower arm seems untreatable in the local hospital. He will be sent, however, to a more specialized center that applies other devices and provides well-trained specialists. This means, this patient will never be left untreated in highly developed countries. Even if the first clinic refuses the treatment, the organizational structure of medicine in general in that country will demand that this patient is sent on to a more specialized center.

In oral implantology it is, however, a routine procedure not to search for alternative treatment methods and to avoid sending patients to (private) competitors who might offer a more modern and more applicable method. This means that only conventional implant systems are used and taught, while other methods are neglected or even actively rejected.

3.3 Real-Life Situations

Imagine a clinic treating patients with conventional OI implants that provides consultation to the general public every day and a number of the consulted patients will be really treated later. However, the guidelines of the clinic management state:

- Not to treat patients above an insulin blood level of XX nmol (the critical amount / the threshold differs between clinics). Therefore, e.g. 20% of the patients seeking treatment are excluded by the physicians.
- Not to treat patients requiring bone augmentation who declare that they regularly smoke. Therefore, another 30% of the patients seeking treatment are excluded because they do not have enough bone for a sufficient number of implants. Only 10% of smokers (33%) receive treatment because they do not require bone augmentation.

- Not to treat patients who are receiving IV bisphosphonate injections (0.1% of the patients are excluded).

Besides the above, the implant success rate after three years is 97%. By applying the ITT Principle, it would result in a 43.1 % failure rate for the classic approach (patients who are denied implant treatment include 20% due to diabetics, another 20% for smoking, and 0.1% of those receiving i.V. bisphosphonate. Total 40.1%). Therefore, a 3% failure rate of the implants (for example) would be reported.

On the other hand, a clinic treating patients with OF implants provides consultation to the general public every day and a number of the consulted patients will be really treated later. The guidelines for treatment, set up by this clinic's management include:

- Not to treat patients who have been treated with IV bisphosphonates (0.1% of the patients are excluded).
- Smokers and diabetic patients are treated without exception and without adjustments of the treatment plan.

Besides these, the implant success rate after three years is 97%. By applying the ITT Principle, it will result in a 3.1 % failure rate for this method of treatment (under the assumption that exactly the same patients were treated).

From this example, we learn that in the clinical reality, many dental offices that offer implants and use the conventional implant treatment will refuse to treat much more cases compared to clinics that work with cortically anchored implants. If their method does not work, the patient is sent home untreated and branded as **"in general untreatable with oral implants"**. Differences between the two methods are presented in **Tab.1**.

3.4 Long-Term Follow-Ups

For example, 100 patients that have undergone a consultation or an oral implant therapy will all count as being included into the study group of a specific clinic and for a specific treatment. Presumably, 40% of the patients were either selected out or refused the treatment (although it was indicated to treat, and the available treatment had a realistic chance for success). Furthermore, it can be assumed

that at the end of the planned observation period (e.g. four years), 50 out of the 60 treated patients were examined, whereas 10 of the treated patients did not turn up for the final control appointment (i.e. they were lost). The treatment had failed in 6 out of the 50 controlled patients. This all must be reported in the publication as follows:

- 40% of the cases turned out to be not treatable in general: for this calculation, the number of consulted patients is considered.
- 10% of the treated and controlled cases had failed: for this calculation, those numbers of patients are calculated which appeared with a failure, out of the 60% of patients who received treatment.
- 10% of the cases were out of control at least at the endpoint of the study. An earlier control date could be considered and reported as endpoints of the study for this group.

In general, we can assume that patients experiencing failure or complications will come to the treatment provider to get this fixed, whereas patients who were out of control (in this example, 10 cases) are likely to be without problems or complication. Only this type of full reporting would make studies on conventional OI and OF implants comparable.

Major differences between methods for oral implants are displayed in the following **Table 1:**

Table 1. The table shows major differences between the method of osseointegration (OI) and the method of osseofixation (OF) regarding permanent and temporary contra-indication as well as regarding patients' reason(s) for refusal to of the treatment

	OI Concept	OF Concept [16]
Permanent medical contraindications for oral implanttreatment which will lead to de-selection of the patient by the treatment provider	• Unfavorable medical conditions (diabetics, hypertension, various medications, IV bisphosphonate treatment, etc.) • Smoking • Insufficient bone supply and • unfavorable conditions for bone augmentation Implant treatment does not provide advantages compared to conservative treatment or no treatment (from patients point of view)	
Temporary medical contraindications for oral implant treatment that will lead to the patient's temporary postponement by the treatment provider	• Implant treatment does not provide advantages compared to conservative treatment or no treatment (from patients point of view) • IV bisphosphonate treatment Periodontal infections, IV bisphosphonate treatment cysts in the bone, infections in the bone, recent radiation therapy • Swellings	IV Bisphosphonate treatment, recent radiation therapy Implant treatment does not provide advantages compared to conservative treatment or no treatment (from patients point of view)
Reasons for the patient's refusal to undergo oral implant treatment	• Long **duration** of treatment hight **costs of implant treatment** • The risks associated with bone augmentation • **Additional costs of bone augmentation** • Fear of repeated pain • Unwillingness to wear an intermediate removable denture or to be without teeth for some time. • Fear of experiencing • Periimplantitis which will lead to pain, infections and eventually to loss of large amounts of bone and the implants	Despite the comparatively lower treatment costs, some patients will postpone or forgo treatment for financial reasons

4. Conclusion

It can be concluded that the inclusion of the rules given through the ITT principle is a crucial step to come to realistic judgments about a treatment's effectiveness and its applicability on the general population. The application of this principle has been neglected since the beginning of scientific publishing in the field of oral implantology. Due to this, all publications as well as the marketing of big and influential manufacturers, but also the teaching of the universities have provided an extremely untrue picture of the results of different treatment methods applications in oral implantology.

Hence, all presently available articles in the field of oral implantology are of severely reduced relevance, as they do not report outcomes of all patients but only those who underwent the treatment. Unfortunately, considering close to 100% of the available data that was collected and reported in the field of conventional OI implantology is of minor relevance, because each patient case was carefully selected for treatment. This explains why university studies yield excellent results, whereas the practitioners who later buy and use the device will use a different set of inclusion criteria, because for financial reasons they are tempted to apply the devices on all of their patients and their results will therefore differ significantly from the university study.

Published results about success rates from clinics that do not obey the ITT principles cannot be compared to results from clinics that openly and meticulously include data of non-treated patients into their statistics, because such publications show what the team and the technology together may achieve. Neglecting the ITT principle seems to have become the standard procedure in the field of scientific reporting in conventional OI implants. This reduces the scientific value of such publications significantly.

Clinicians, institutions, and policy makers use results from randomized controlled trials or cohort studies to make decisions regarding therapeutic interventions for their patients and populations. Knowing the applicability and the effect that an intervention has on patients in clinical trials is crucial for making decisions for individual patients as well

population-oriented decisions. Published studies that do not respect the ITT principle are in general of no value for the aforementioned deciders when it comes to deciding in which direction the health system, the University teaching or a private or state clinic should be developed.

Author Contributions

Conceptualization, S.I. and A.I.; methodology, O.S.; validation, S.I., A.I., O.S. and Ł.P.; formal analysis, S.I. and Ł.P.; investigation, A.I. and O.S.; resources, S.I. and A.I.; data curation, S.I., A.I. and O.S.; writing—original draft preparation, S.I. and Ł.P.; writing—review and editing, S.I., A.I., Ł.P. and O.S.; visualization, S.I. and A.I.; supervision, Ł.P.; project administration, S.I., A.I. and O.S.; funding acquisition, S.I.

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References

1. Wright CC, Sim J. Intention-to-treat approach to data from randomized controlled trials: a sensitivity analysis. J Clin Epidemiol. 2003;56(9):833-842. doi:10.1016/s0895-4356(03)00155-0

2. Armijo-Olivo, S., Barbosa-Silva, J., de Castro-Carletti, E. M., de Oliveira-Souza, A. I. S., Pelai, E. B., Mohamad, N., Baghbaninaghadehi, F., Dennett, L., Steen, J. P., Kumbhare, D., & Ballenberger, N. (2024). INTENTION TO TREAT ANALYSIS IN CLINICAL RESEARCH: BASIC CONCEPTS FOR CLINICIANS. American journal of physical medicine & rehabilitation, 10.1097/PHM.0000000000002444. Advance online publication. https://doi.org/10.1097/PHM.0000000000002444

3. White IR, Carpenter J, Horton NJ. Including all individuals is not enough: lessons for intention-to-treat analysis. Clin Trials. 2012;9:396–407.

4. Beckett RD, Loeser KC, Bowman KR, Towne TG. Intention-to-treat and transparency of related practices in randomized, controlled trials of anti-infectives. BMC Med Res Methodol. 2016 Aug 24;16(1):106. doi: 10.1186/s12874-016-0215-2. PMID: 27557676; PMCID: PMC4997732.

5. Polit DF, Gillespie BM. Intention-to-treat in randomized controlled trials: recommendations for a total trial strategy. Res Nurs Health. 2010;33(4):355-368. doi:10.1002/nur.20386

6. Dettori JR, Norvell DC. Intention-to-Treat: Is That Fair? Global Spine J. 2020 May;10(3):361-363. doi: 10.1177/2192568220903001. Epub 2020 Jan 24. PMID: 32313802; PMCID: PMC7160802.

7. Bondemark L, Abdulraheem S. Intention to treat (ITT) analysis as reported in orthodontic randomized controlled trials-evaluations of methodology and recommendations for the accurate use of ITT analysis and handling dropouts. Eur J Orthod. 2018 Jul 27;40(4):409-413. doi: 10.1093/ejo/cjx084. PMID: 29069355.

8. Kruse RL, Alper BS, Reust C, Stevermer JJ, Shannon S, Williams RH. Intention-to-treat analysis: who is in? Who is out? J Fam Pract. 2002 Nov;51(11):969-71. Erratum in: J Fam Pract. 2002 Dec;51(12):1079. PMID: 12485553.

9. Elani HW, Starr JR, Da Silva JD, Gallucci GO. Trends in Dental Implant Use in the U.S., 1999-2016, and Projections to 2026. J Dent Res. 2018 Dec;97(13):1424-1430. doi: 10.1177/0022034518792567. Epub 2018 Aug 3. PMID: 30075090; PMCID: PMC6854267.

10. Clark D, Levin L. In the dental implant era, why do we still bother saving teeth? Dent Traumatol. 2019 Dec;35(6):368-375. doi: 10.1111/edt.12492. Epub 2019 Oct 14. PMID: 31132200.Dent. J. 2023, 11(7), 165; https://doi.org/10.3390/dj11070165

11. Al-Haj Husain, A.; De Cicco, O.; Stadlinger, B.; Bosshard, F.A.; Schmidt, V.; Ö zcan, M.; Valdec, S. A Survey on Attitude, Awareness, and Knowledge of Patients Regarding the Use of Dental Implants at a Swiss University Clinic. Dent. J. 2023, 11, 165. https://doi.org/10.3390/dj11070165

12. Wagner J, Spille JH, Wiltfang J, Naujokat H. Systematic review on diabetes mellitus and dental implants: an update. Int J Implant Dent. 2022 Jan 3;8(1):1. doi: 10.1186/s40729-021-00399-8. PMID: 34978649; PMCID: PMC8724342.https://doi.org/10.1111/clr.14109

13. Hamilton A, Gonzaga L, Amorim K, Wittneben JG, Martig L, Morton D, Martin W, Gallucci GO, Wismeijer D. Selection criteria for immediate implant placement and immediate loading for single tooth replacement in the maxillary esthetic zone: A systematic review and meta-analysis. Clin Oral Implants Res. 2023 Sep;34 Suppl 26:304-348. doi: 10.1111/clr.14109. PMID: 37750515.

14. El-Anwar MI, El-Zawahry MM, Ibraheem EM, Nassani MZ, ElGabry H. New dental implant selection criterion based on implant design. Eur J Dent. 2017 Apr-Jun;11(2):186-191. doi: 10.4103/1305-7456.208432. PMID: 28729790; PMCID: PMC5502562.

15. Schliephake H. The role of systemic diseases and local conditions as risk factors. Periodontol 2000. 2022 Feb;88(1):36-51. doi: 10.1111/prd.12409. PMID: 35103330.

16. Chiapasco M, Gatti C. Implant-retained mandibular overdentures with immediate loading: a 3- to 8-year prospective study on 328 implants. Clin Implant Dent Relat Res. 2003;5(1):29-38. doi: 10.1111/j.1708-8208.2003.tb00179.x. PMID: 12831726.

17. Mitsias M, Siormpas K, Pistilli V, Trullenque-Eriksson A, Esposito M. Immediate, early (6 weeks) and delayed loading (3 months) of single, partial and full fixed implant supported prostheses: 1-year post-loading data from a multicentre randomised controlled trial. Eur J Oral Implantol. 2018;11(1):63-75. PMID: 29557401.

18. Lazarov A. Immediate Functional Loading: Results for the Concept of the Strategic Implant® . Ann Maxillofac Surg. 2019 Jan-Jun;9(1):78-88. doi: 10.4103/ams.ams_250_18. PMID: 31293933; PMCID: PMC6585197.https://doi.org/10.4103/ams.ams_250_18

19. Olijnyk L, Darsaut TE, Ö hman J, Raymond J. Understanding intent to treat analyses: An important lesson from the international cooperative study on the timing of aneurysm surgery. Neurochirurgie. 2022 Oct;68(5):471-473. doi: 10.1016/j.neuchi.2022.02.002. Epub 2022 Feb 7. PMID: 35143810.

20. Buijs GJ, Stegenga B, Bos RRM. Efficacy and Safety of Biodegradable Osteofixation Devices in Oral and Maxillofacial Surgery: a Systematic Review. Journal of Dental Research. 2006;85(11):980-989. doi:10.1177/154405910608501102

21. Pałka ŁR, Lazarov A. Immediately Loaded Bicortical Implants Inserted in Fresh Extraction and Healed Sites in Patients with and Without a History of Periodontal Disease. Ann Maxillofac Surg. 2019 Jul-Dec;9(2):371-378. doi: 10.4103/ams.ams_147_19. PMID: 31909018; PMCID: PMC6933992.

22. de Oliveira Limírio JPJ, Lemos CAA, de Luna Gomes JM, Minatel L, Alves Rezende MCR, Pellizzer EP. A clinical comparison of 1-piece versus 2-piece implants: A systematic review and meta-analysis. J Prosthet Dent. 2020 Oct;124(4):439-445. doi: 10.1016/j.prosdent.2019.08.002. Epub 2019 Dec 18. PMID: 31862146.

23. Ihde S, Sipic O. Dental Implant Treatment and Immediate Functional Loading (1). Case Report and Considerations: Extended Treatment Options Using the Strategic Implant® and Indications and Objectives for Comprehensive Dental Implant Treatment. Ann Maxillofac Surg. 2019 Jul-Dec;9(2):465-469. doi: 10.4103/ams.ams_146_19. PMID: 31909037; PMCID: PMC6933964.

24. Wang Y, Zhang Y, Miron RJ. Health, Maintenance, and Recovery of Soft Tissues around Implants. Clin Implant Dent Relat Res. 2016 Jun;18(3):618-34. doi: 10.1111/cid.12343. Epub 2015 Apr 15. PMID: 25873299.

25. Katranji A, Misch K, Wang HL. (2007), Cortical Bone Thickness in Dentate and Edentulous Human Cadavers. Journal of Periodontology, 78: 874-878. https://doi.org/10.1902/jop.2007.060342

26. Introduction into the Work with the Strategic Implant® Definitions, General Explanations and Treatment Planning – Ihde & Ihde

27. Rivis, M.; Roi, C.; Roi, A.; Nica, D.; Văleanu, A.; Rusu, L.-C. The Implications of Titanium Alloys Applied in Maxillofacial Osteosynthesis. Appl. Sci. 2020, 10, 3203. https://doi.org/10.3390/app10093203

28. Awadalkreem F, Khalifa N, Satti A, Suleiman AM. The Influence of Immediately Loaded Basal Implant Treatment on Patient Satisfaction. Int J Dent. 2020 Apr 14;2020:6590202. doi: 10.1155/2020/6590202. PMID: 32351569; PMCID: PMC7178505.