LITERATURE REVIEW

Implant Success, Survival and Failure: Literature Review

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ABSTRACT

Aim: Failures in implantology are a factor in the development and correct analysis of their frequency of occurrence, of their probable origin, associated problems can at least mitigate their effects. **Methods:** We carried out a systematic review of the literature followed by a Meta-analysis. A computer and manual was conducted on the PubMed database. The search was conducted on articles published between 2011 and June 2021. The inclusion criteria: prospective and retrospective studies treating the survival rate and implant failures with a mean follow-up of 5 years and more. The criteria for non-inclusions: Case studies (case report), manufacturer-funded studies. **Results and Discussion:** 37 studies that met our inclusion criteria derived from an initial count of 6944 titles and 272 abstracts from systematic review publications were selected and data were extracted. Based on the meta-analysis survival of affected implants 97.7% at 5 years and 92.8% at 10 years, 96.3% for single crowns of which 96.5% cemented and 89.3% targeted and 94.5% for bridges, early mechanical failures and biological had a rate of 3.6% and 7.1% as cosmetic complications. On the other hand, it appears that there is no statistically significant difference between maxilla and mandible as to the distribution of lost implants or the type of implant connection used. **Conclusion**: The results of the present systematic review demonstrated a positive learning curve in implant dentistry, represented in higher survival rates and lower complication rates reported in more recent clinical studies. The incidence of esthetic, biologic, and technical complications, however, is still high. Hence, it is important to identify these complications and their etiology to make implant treatment even more predictable in the future.

Key words: Failures, implant survival rate, complications, Meta-analysis

INTRODUCTION

Failures in implantology are a factor for development and an analysis correct frequency of occurrence, probable origin, and associated problems can at least mitigate their effects. The hypothesis put forward is that there is no significant difference between the maxilla and the mandible in terms of the distribution of implants lost with an average follow-up of 5 years and to what extent do mechanical, biological and aesthetic complications arise?.

The definition of implant failure is very arbitrary. It encompasses a wide variety of clinical situations, ranging from symptomatic mobile implants to implants showing more than 0.2 mm of peri-implant bone loss after the first year of loading. In fact, the definition of implant failure depends on the criteria adopted. For Albrektsson [1,2], the following criteria must be met to define implant success: 1) absence of clinical mobility, 2) radiologically detected marginal bone loss <1.5 mm during the first year of loading, 3) radiologically detected marginal bone loss <0.2 mm per year after the first

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year of implementation of the implant, 4) absence of pain and / or paresthesia and 5) the success rate must be greater than or equal to 85% after 5 years of follow-up and greater than or equal to 80% after 10 years.

Implant failures can be divided into 4 categories (Esposito et al. [3]): Biological failures defined as the inability of host tissues to establish or maintain osseointegration. They are divided, according to the chronological criterion, into early or primary failures (failures to accomplish osseointegration) and late or secondary failures (failures to maintain osseointegration). Early failures occur a few weeks to a few months after implantation, during the burying period or are detected when the implant is put into operation. Late failures are encountered after loading of the implants. They are characterized by a loss of osseointegration; this can be progressive or can manifest itself quickly.[4,5]

2) Mechanical failures, represented by the failure of implant components (fracture of implants, screws or prostheses).

3) Iatrogenic failures, such as implant bad positions making implants useless as pillars or anchors. This group also includes implants that must be removed from cause of the violation of noble anatomical structures such as the inferior dental nerve.

4) Functional failures can be related to psychological, aesthetic and phonetic problems of the patients.

MATERIAL AND METHODS

We performed a systematic review of the literature followed by a Meta-analysis. A computer and manual search using the combination of the MeShs words «survival rate» AND «implant» AND «failure» was conducted on the PubMed database. The search was conducted on articles published between 2009 and June 2019. Searches were limited to articles published in English and French.

The Inclusion Criteria:

-Prospective and retrospective studies treating the survival rate and implant failures with an average follow-up of 5 years and more

-Clinical studies> 10 patients

-Studies of systematic reviews and Meta-analyzes and RCT randomized clinical studies

The criteria for non-inclusions:

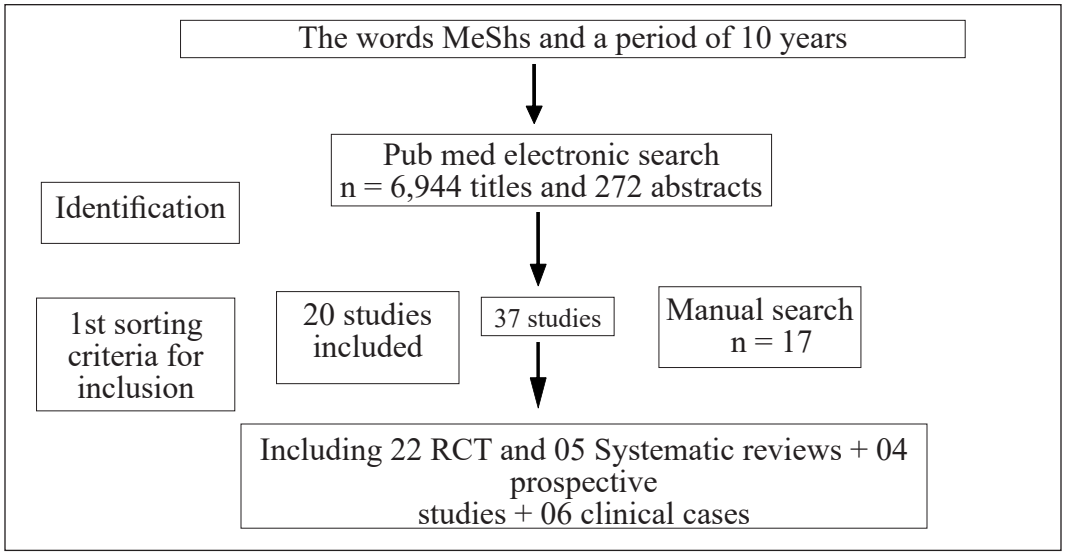
-Case studies (case report)

-Studies funded by the manufacturer

RESULTS AND DISCUSSION

Based on the Meta-analysis, the survival of implants reached 97.7% at 5 years and 92.8% at 10 years, 96% for single crowns of which 96.5% sealed and 89.3% targeted and 95, 76% for bridges, early mechanical and biological failures had a rate of 3.6% and 7.1% as aesthetic complications.

Failures can be divided into early and late failures. The former occur during the healing period or when the abutments are connected, while the latter occur after the implants have been loaded.



In the literature, out of 4.6% late failures, 90% are related to peri-implantitis and 10% are due to occlusion.

Early failures, occurring before implant loading, and late failures. Regarding early failures, the main causative factors reported would be excessive surgical trauma, impaired tissue healing, presence of infection, smoking or premature weight bearing. Surgical trauma as well as anatomical conditions could be associated with nearly 3.6% of these failures [6]. Late failures, on the other hand, occur after implant loading. They are thought to be related mainly to peri-implant problems, excessive occlusal forces as well as host and implant characteristics [7,8]. Among these failures, we find peri-implant mucositis as well as peri-implantitis. The latter usually occurs insidiously and can eventually lead to implant loss [9, 10, 11,12]. However, there are several controversies surrounding peri-implantitis. In fact, no data is currently available regarding the exact prevalence of this disorder, its risk factors or its optimal treatment.

Fatigue fractures are caused by low stress but repeated over millions of cycles. They are caused by errors in the choice of the implant, by design defects of the prosthesis, in his study Goodacre reports that the fracture of the implant is the rarest mechanical complication with an average incidence of 1%.[13,14]

Higher value was reported by Stoichkov and co-workers [15]. In this study, 5 implants fractured from a total of 218 (percentage 2.3%) in 101 patients followed for a period ranging between three to 10 years

Higher incidence of implant fractures was established in the area of the molars and premolars. Based on the study by Gargallo-Albiol and coll.[16]

Biological complications in the form of bone loss> 2mm was 6.97% and peri implantitis was 6.37%.(Mombelli et Lang [17])

Another cause of late implant failure that can be classified as prosthetic causes is the persistence of crown cement in the sulcus (Gapski et al. [18]); it can cause chronic irritation to the bones and gums; peri-implantitis

Mechanical complications came in 3 forms:

-Ceramic fracture: 5.93%

-Loosening: 11.68%

-Unscrewing: 9.4%, according to Kallus and Bessing most often the fracture of a screw is preceded by one or more loosening. [19]

In the light of a large number of studies, occlusal overload is the main cause of mechanical complications; moreover it could compromise osteo-integration

The fracture of the implant can have several origins, either related to the implant or related to the prosthesis, Morgan et al have shown by comparing 5 implants fractures in the mouth to implants fractures in the laboratory that it was each time from stress fracture and not from shock.[20,21]

When the abutments are factories and therefore fully adapted, the main cause of their fracture is the occlusion or elements in excessive extension, the average incidence of a fracture of the screws of a prosthesis supporting a total prosthesis is very slightly lower to that supporting a partial prosthesis, 3% against 5%.[22]

Despite a constant technical and practical development of the discipline, practitioners have observed stagnation in the overall success rate, but also a significant increase in implant failure outside the determination of the cause of the failure is not always obvious. The studies have shown that the implant length does not influence the failure rate; however, it appears that there is no statistically significant difference between the maxilla and the mandible as to the distribution of lost implants or the type of connection used. The percentage of biological complications is higher than those of mechanical complications

CONCLUSION

The results of the meta-analysis showed that over a 10-year period one in 20 implants would be lost and that despite the high survival rate, mechanical, biological and aesthetic complications were frequent.

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