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Influence of Cantilever Extension on Implant Survival Rate and Clinical Outcomes in Partially Edentulous Patients: Systematic Review

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Abstract

Purpose: was to assess the survival and complication rate of implant supported cantilever fixed dental prosthesis in fixed partial dentures.

Materials and methods: Two operators searched the literature (MEDLINE, EMBASE) and Google Scholar from 2012 up to July 2023.Only articles evaluating cantilevered implant-fixed restorations in at least 10 patients with an average follow-up of at least 5 years were selected. Outcome variables included implant and prosthetic survival, mechanical, technical, and biological complications. The review was conducted in accordance with PRISMA's statement. Evaluation of risk of bias was assessed. Failure and complication rates were analyzed.

Results: Ten papers were chosen to examine the effectiveness of cantilevered prosthesis treatment in partially edentulous patients, with the results indicating a high survival rate. The estimated survival rate for 5 to 10 years was found to be 98.26% for the implants and 98,43% for the rehabilitations. Some mechanical, technical, and biological complications were reported, resulting in a total complication rate of 5,51% and 3,51% for the patients and the prosthesis respectively, over a period of 5 to 10 years. However, two papers on the subject of a single implant supporting a 2-unit cantilever were insufficient to draw any definitive.

Conclusions: Clinical evidence suggests that cantilevers may prove to be an effective treatment for patients who are partially edentulous. It should be noted, however, that there is currently insufficient data available to make any conclusions or classifications regarding the use of cantilevers in partially edentulous patients.

Keywords: Low risk of bias, Moderate risk of bias, high risk of bias, Cohen's kappa-K statistic, mucositis and peri-implantitis, mono-implant prosthesis, Smoking, Bruxism, Periodontal disease

Introduction

Dental implant placement may be limited by anatomical conditions, which can be overcome by different solutions: surgical bone grafting procedures, different prosthetic designs or implants of smaller size: short or tilted implants may be a less invasive but effective procedure. One of the prosthetic alternatives is the use of cantilevered prostheses (implant cantilevered fixed dentures). It is an option for patients with anatomically compromised sites or those with limited finances or who cannot afford complex treatments.

With this design, neither the implant nor the biomaterial is placed in the resorbed area, reducing the risk of failure and making the treatment less invasive. A biomechanical risk of cantilever may be rehabilitation overload, which could lead to implant and/or prosthetic failure. In literature, the use of cantilever can be found in fixed partial dentures (Partial implant cantilevered fixed dental prosthesis), in fully edentulous cases (full arch implant cantilevered fixed dental prosthesis) and in cases where one implant supports two teeth (single implant cantilevered fixed dental prosthesis). The main objective of this systematic review was to assess the survival and complication rate of implant supported cantilever fixed dental prosthesis in fixed partial dentures.

Materials and Methods

The present systematic review was designed to report data on partial fixed prosthesis with cantilever. The present review is reported according to the PRISMA (Preferred Reporting Items for Systematic review and Meta-Analyses) statement criteria-2009. The focused question was: "Can the rehabilitation of well-appearing and partially edentulous patients by partial cantilevered implant supported restorations be considered a reliable alternative to conventional implant-supported prostheses? The preliminary

PICO question was used to define the impact of cantilevers on Implant and prosthetic survival rate:

Population(P): Patients who received partial cantilevered implant supported rehabilitations.

Types of interventions (I): Any rehabilitations that was produced with cantilevered teeth. Two different kinds of restorations were investigated: fixed partial restorations and single implants supporting two-crown restorations.

Types of outcome measures (O): Several variables were considered for analysis:

a) Implant survival rate

b) Prosthetic survival rate

c) Biological complications

d) Prosthetic complications (Mechanical and Technical)

Search Strategy

Two electronic databases were searched: The National Library of Medicine (MEDLINE by Pubmed) and Google Scholar. It is used to perform electronic searches of relevant published studies in English from 2012 up to July 2023, according to the following terms were searched in Boolean equations: dental implant AND (cantilever or extension or "fixed dental prosthesis" or "fixed partial denture" or "single implant"). After the selection of articles beginning with the reading of the title and abstract, the complete texts of the studies of interest were assessed for analysis using the pre-established inclusion and exclusion criteria.

Inclusion Criteria

The articles were included if they meet these criteria:

i. Only clinical studies in vivo: both prospective and retrospective studies randomized and controlled clinical trials as well as cohort studies and case series.

ii. Clinical Studies had to report data on a minimum of 10 participants and have a minimum of 5-year follow-up.

iii. Article dealing with partial cantilevered fixed partial implant prosthesis; written in English.

iv. Published from 2013 to July 2023.

Exclusion criteria

Articles were excluded if they meet one of the following criteria:

i. Clinical articles with a less than 5-year follow-up and/or with less than 10 patients were excluded.

ii. The studies before 2013

iii. Articles that have titles or summaries that did not seem appropriate to our topic.

iv. Letters, narrative reviews questionnaires and Case reports.

Data Extraction

For each included study the following data were collected by two review authors, using a specially designed data abstraction form: names of the authors, year of publication, title, Study design, number of treated patients, number and type of applied implants, implant manufacturer and data on restorations were extracted follow-up period, and details of outcomes reported (Survival rate of implant and prosthesis then Biological and technical complications). When the reported data were unclear, authors contacted by emails the corresponding authors and asked for more information.

Risk of Bias Assessment

Quality assessment of included studies was carried out independently by two reviewers, using specially designed tools to assess risk of bias in the following areas:

a) Definition of inclusion and exclusion criteria

b) Description of result measurement method Integrity of reporting results data

Recall (if dropout rate < 10%, assume low risk; if between 10% and 20%, assume unclear; if > 20%, assume high risk).

i. Sample size (considered low risk if more than 30 patients were treated; high risk if fewer than 30 patients were treated).

ii. Number of surgeons involved (considered low risk if the same surgeon performed all procedures; high risk if more than one surgeon performed all procedures).

For each domain, low, unclear, or high risk of bias was identified according to the assessment criteria as described in the Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0.

After assessing each of the above domains, the research is divided into the following categories:

i. Low risk of bias if all criteria are met.

ii. Moderate risk of bias when one or more criteria were partially met, or judgment was unclear.

iii. If one or more criteria are not met, there is a high risk of bias (plausible bias that seriously reduces confidence in the results).

Statistical Analysis

Failure and complication rates were calculated by dividing the number of events (failure or complication) in the numerator by the total exposure time (implant, patient, or prosthetic time) in the denominator. Failures and complications were also extracted directly from publications as mean follow-up time. Data were analyzed descriptively given the heterogeneity of the criteria

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used to define treatment outcomes. Inter-rater agreement was determined using Cohen's kappa-K statistic.

Results

Study selection

The electronic search identified more than 377 articles. Out of the 15 articles obtained, 362 were excluded based on initial screening of the title and abstract, as they are not relevant to the objectives of the present review. After the application of the inclusion and exclusion criteria during the reading of the complete texts, ten articles were included in the present study (Figure 1).

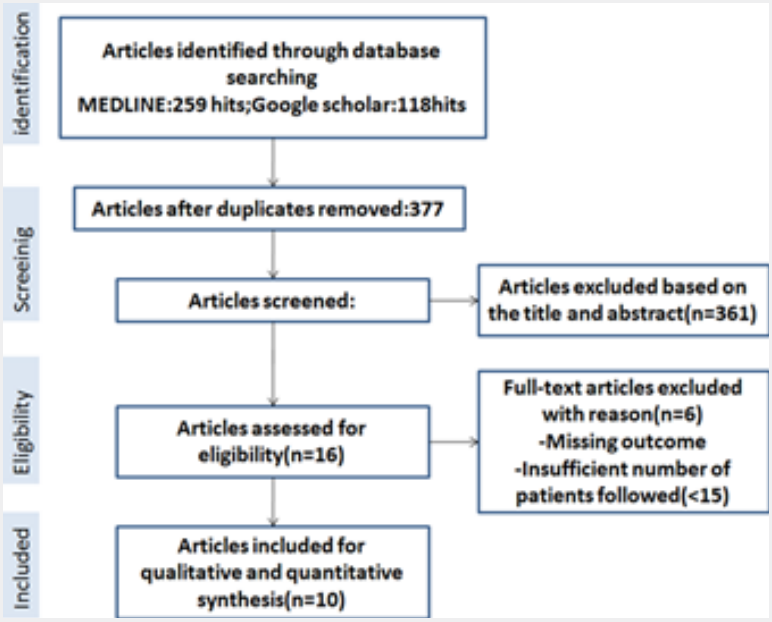

Figure 1: Flowchart of published literature search strategy.

Description of included studies

Of the 10 articles included in the systematic review, 5 were retrospective studies [1-5], one was an RCT [6] while the other was a prospective non-randomized trial (PS) [6]. One article by De Souza et al. [7] used a split-mouth approach, while all the remaining papers were parallel studies. All the information is reported in Tables 1.

Table 1: Description of the included studies.

Author-year	Study design	Number of patients/ prostheses	implant system, length (mm) and diameter (mm)	Type of prosthesis	Location
Aglietta et al. [13]	Retrospective cohort study	38 patients with 40 Prostheses	System: Straumann® _Diameter: 4.1 and 4.8 _Length: not indicated	Screwed or cement implant prosthesis fixed on one or more implants,.	the upper and lower arch.
Galal et al. [14]	Randomized prospective study	20 patients with 20 Prostheses	_ System: Dentium® _ Diameter: 4,5 _ Length: 10	Cement mono-implant metal prostheses	posterior maxillary and mandibular sector.
Jensen-Louwerse et al. [15]	Retrospective case series study	23 patients with 28 Prostheses	_System: Astra-tech® _Diameter: 4 _Length: de 8 à 13	Screwed or Cement mono-implant ceramic prostheses	posterior maxillary and mandibular sector.

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Kim et al., [8]	Retrospective cohort study	107 patients with 128 Prostheses	_System: divers _Diameter: 3,3 à 4 _Length: 7 à 25	not specified.	the upper and lower arch.
Malo &Nobre, [9]	Retrospective cohort study	174 patients with 191 Prostheses	_System: Brånemark Nobel Biocare _Diameter: 3,3 4 _Length: 7 à 18	Screwed or cement implant prosthesis. fixed on one or more implants.	the entire upper and lower arch.
Nelluri et al. [4]	Prospective cohort study	30 patients with 30 Prostheses	_System: Adin® _Diameter: 3.5 _Length: 13	Screwed mono-implant prostheses	_Location: 31-41
Premnath et al., [10]	Retrospective cohort study	120 patients with 300 implants	_System: Dentium® _Diameter et length not specified.	implant prosthesis fixed on two implants	not specified.
Roccuzzo et al., [16]	retrospective study (series of cases)	16 patients with 19 Prostheses	_System: Straumann®, Astra-tech® _Diameter: 3,5 à 5 _Length not specified.	cement implant prosthesis fixed on one implant	Maxillary and mandibular anterior sector.
Schmid et al., [11]	Retrospective cohort study	26 patients with 30 60 implants	_System: Straumann® _Diameter: 3,3, 4,1 et 4,8 _Length: 8, 10 et 12	Screwed or cement implant prosthesis. fixed on one or more implants.	Maxillary and mandibular posterior sector.
Schmid et al., [12]	Retrospective cohort study	21 patients with 25 implants	_System: Straumann® _Diameter: 4,1 et 4,8 _Length: 8, 10 et 12	cement implant prosthesis fixed on one implant	Maxillary and mandibular posterior sector.

Risk of bias

The risk of bias among the included studies is reported in Table 2. Five studies were classified as low risk of bias Kim et al. [8]; Malo & Nobre [9]; Premnath et al. [10]; Schmid et al. [11]; Schmid et al. [12], three as moderate risk of bias Aglietta et al. [13]; Galal et al. [14]; Jensen-Louwerse et al. [15], and two as serious risk of bias Nelluri et al. [6]; Roccuzzo et al. [16].

i. Definition of inclusion/exclusion criteria

ii. Description of the results analysis method

iii. Completeness of reported results

iv. Dropout rate

v. Number of patients/prostheses

vi. Number of practitioners +: low risk of bias; ±: Moderate risk of bias: High risk of bias? Criterion not dealt with in the article

Implant survival

The implant survival rate varies between 94.6% and 100%. The overall survival rate calculated based on the follow-up period of each study is 98.26%. No significant difference was noted between the values of each study for a confidence interval of 95%. The data studied and the statistical analysis are described in Table 3 and Figure 2.

Aglietta et al. [13]; Galal et al. [14]; Jensen-Louwerse et al. [15]; Kim et al. [8]; Malo & Nobre [9]; Nelluri et al. [6]; Premnath et al. [10]; Roccuzzo et al. [16]; Schmid et al. [11]; Schmid et al. [12]

Prosthetic survival

The prosthetic survival rate varies between 94.6% and 100%. The overall survival rate calculated based on the follow-up period of each study is 98.43%. No significant difference was noted between the values of each study for a confidence interval of 95%. The data studied and the statistical analysis are described in Table 4 and Figure 3.

Potential complications

Biological complications: The biological complications are listed in the following table (Table 5):

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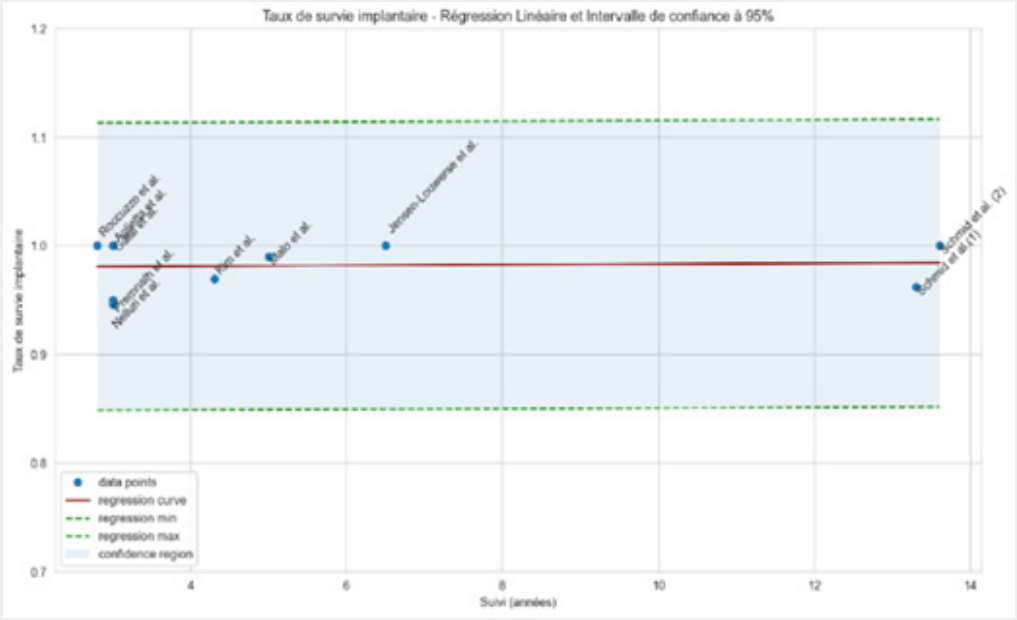

Figure 2: Linear regression curve of the implant survival rate according to the duration of follow-up.

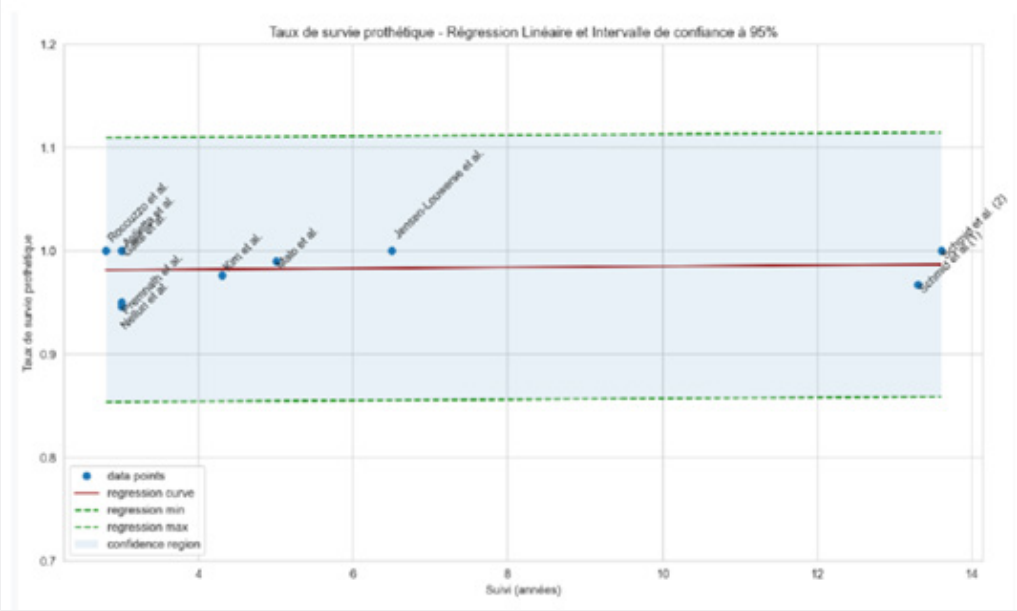

Figure 3: Linear regression curve of the prosthetic survival rate according to the duration of follow-up.

Data on the issues that have been mentioned are not included in the study by Premnath et al. [17]. Red-highlighted cells in the table denote differences from the study remainders that are considerably greater. The values of T for the two biological complications are shown in the graph below, along with their combined (Figure 4).

The research by Jensen-Louwerse et al. [15] exhibits a considerably higher than usual incidence of occurrence of overall biological complications (mucositis and peri-implantitis), according to a predefined 95% confidence range. _According to Schmid et al.'s study [11], peri-implantitis occurs at a rate that is noticeably greater than the national norm. For the remaining

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values, no additional statistically significant difference was discovered.

Prosthetic complications

The prosthetic complications are listed in the following table (Table 6).

Table 2: Description of the risk of bias among the included studies.

Article studied	1	2	3	4	5	6	Risk of bias
Aglietta et al., [13]	+	+	+	+	-	?	moderate
Galal et al., [14]	+	+	+	+	-	?	moderate
Jensen-Louwerse et al., [15]	+	+	+	-	+	+	moderate
Kim et al., [8]	+	+	+	+	+	+	low
Malo &Nobre, [9]	+	+	+	+	+	?	low
Nelluri et al., [4]	+	+	-	-	-	?	serious
Premnath et al., [10]	+	+	+	+	+	?	low
Roccuzzo et al., [16]	-	+	±	-	-	?	serious
Schmid et al., [11]	+	+	+	+	+	?	low
Schmid et al., [12]	+	+	+	+	+	?	low

Table 3: Implant survival rate and duration of clinical follow-up

Article	1	2	3	4	5	6	7	8	9	10	Mean
Implant Survival (%)	100	100	100	96,9	99	95	94,6	100	96,2	100	98,26
Clinical Follow-Up (Year)	3	3	6,5	4,3	5	3	3	2,8	13,3	13,6	

Table 4: Prosthetic survival rate and duration of clinical follow-up.

Article	1	2	3	4	5	6	7	8	9	10	Mean
Prosthetic survival rate (%)	100	100	100	97,65	99	95	94,6	100	96,7	100	98,43
Clinical follow-up (year)	3	3	6,5	4,3	5	3	3	2,8	13,3	13,6	

Table 5: The biological complications and duration of clinical follow-up.

Article étudié	1	2	3	4	5	6	7	8	9	Mean
Follow-up (years)	3	3	6,5	4,3	5	3	2,8	13,3	13,6	
Number of prostheses	40	20	28	124	172	30	19	30	25	
Peri-implant mucositis	0	3	25	14	0	0	0	7	13	
T(Mucosite)	0	5	13,74	2,63	0	0	0	1,75	3,82	2,91
Peri-implantitis	0	0	5	1	5	0	0	7	0	
T(P-I)	0	0	2,75	0,19	0,58	0	0	1,75	0	0,59
Total biological complications	0	3	30	15	5	0	0	14	13	
T(C-B)	0	5	16,48	2,81	0,58	0	0	3,51	3,82	3,51

Table 6: The prosthetic complications and duration of clinical follow-up.

Article étudié	1	2	3	4	5	6	7	8	9	Mean
Prosthesis fracture	0	0	2	0	3	3	0	3	0	
T (fractures)	0	0	1,10	0	0,35	4,76	0	0,75	0	0,77
Loss of retention	0	3	2	0	14	17	0	17	6	
T(Retention)	0	5	1,10	0	1,63	26,98	0	4,26	1,76	4,53
Technical Complications	0	3	4	10	17	20	0	20	6	
T(C.T)	0	5	2,20	1,88	1,98	31,75	0	5,01	1,76	5,51

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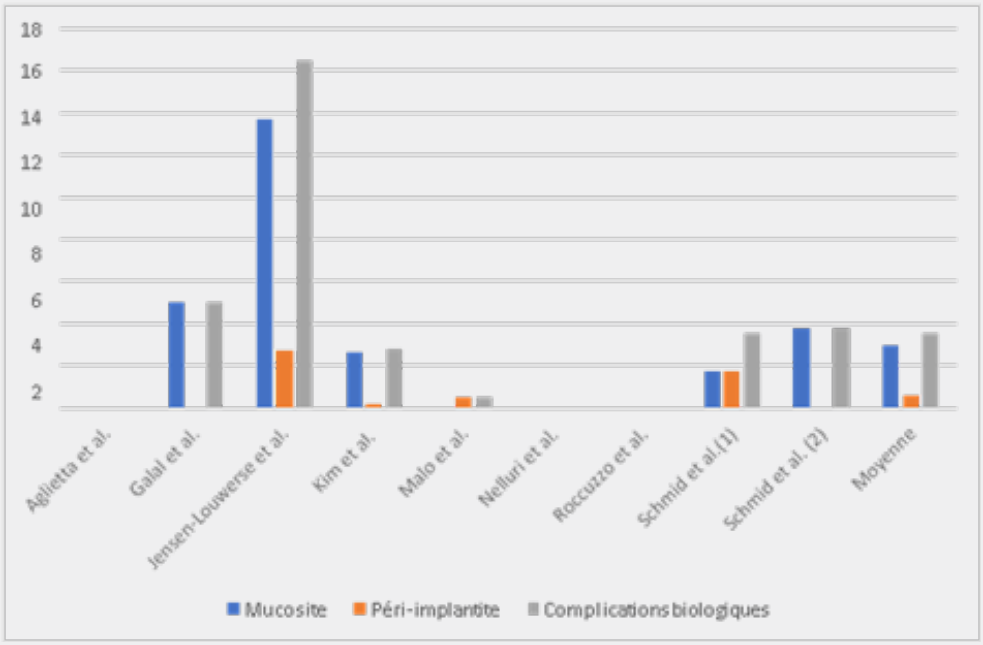

Figure 4: The research by Jensen-Louwerse et al. [15] exhibits a considerably higher than usual incidence of occurrence of overall biological complications (mucositis and peri-implantitis), according to a predefined 95% confidence range. According to Schmid et al.'s study [11], peri-implantitis occurs at a rate that is noticeably greater than the national norm. For the remaining values, no additional statistically significant difference was discovered.

Figure 5 In their study, Nelluri et al. [6] found that the average rate of prosthetic problems, such as fractures and unscrewing of the prosthesis, was much greater. For the remaining values, there is no additional statistically significant difference.

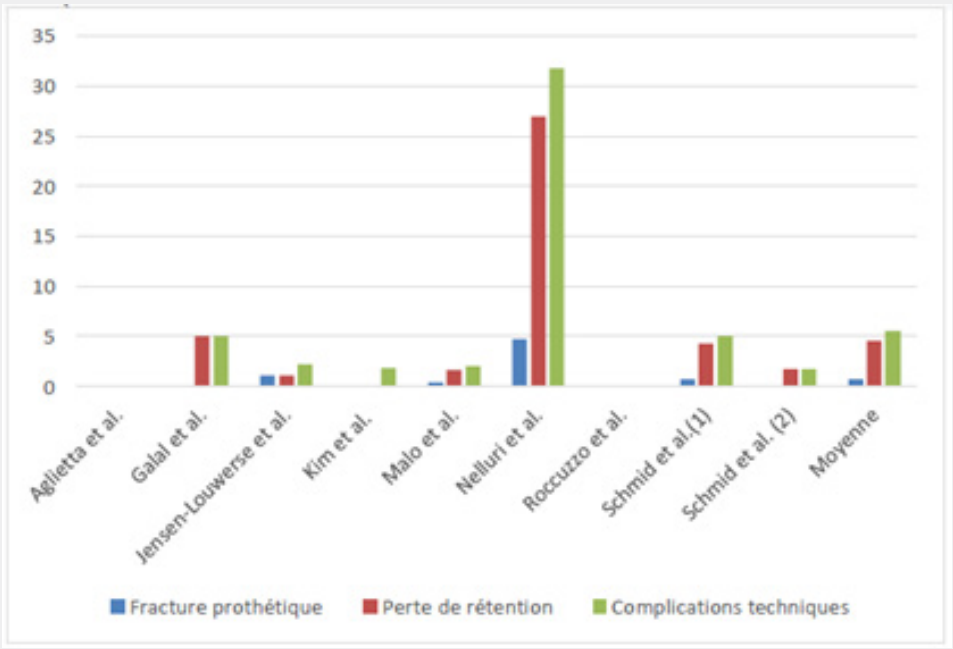

Figure 5: The graph below represents the values of T for each of the prosthetic complications as well as their sum.

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Discussion

Implant survival

The average implant survival rate was 98.26%. Values reported by each study varied between 94.6% and 100%. This average is very close to that in the review by Storelli et al. found value. [18] (97.8% for single implant restorations and 98.9% for multiple implant partial restorations). Review by Van Nimwegen et al. [19] also mentioned survival rates ranging from 96.6% to 100%. Other studies of a little number of articles also matched very high implant survival rates: Da Silva et al. [20] analyzed clinical studies comparing lengthening and non-lengthening prostheses. Survival rates in both groups were greater than 95%. Of the 900 implants examined, 19 implant failures were observed, the most common cause of which was poor implant osseointegration. In fact, all studies by Nelluri et al. [4] and Malo & Nobre [9] observed within the first 4 months after implant placement.

It is unlikely that these early failures were due to prosthetic stretching and other risk factors may have been involved. Some of these implants have been placed in smoking patients or in areas with reduced periodontal tissue. Another cause of failure is implanting fracture. Although less common, this complication was identified only once in two studies Kim et al. [8], Schmid et al. [11]. While the second study clearly stated that the only reported cases of implant fracture were 3.3 mm implants, in the study by Kim et al. [8] is not specified. However, it should be noted that implants with a diameter of 3.25 mm were used in this study. It should also be noted that 4 studies exclusively using implants with a diameter greater than or equal to 4 mm all showed 100% implant survival Aglietta et al. [13], Jensen-Louwerse et al. [15], Galal et al. [14], Schmid et al. [12].

For single-implant prostheses, the implant survival rate remains high. In five studies specifically dealing with single-implant fixed prostheses Nelluri et al. [4], Galal et al. [14], Raccuzzo et al. [16], Jensen-Louwerse et al. [15], Schmid et al. [12]. Only one failure was detected within the first 3 months after placement of the relevant implant. All these observations lead us to conclude that the presence of extensions does not affect implant survival in any way. Within the scope of this work, we can even confirm that the presence of a prosthesis in extension has very little prognostic effect on implant survival. This statement is fully consistent with observations cited in the literature regarding the clinical use of this prosthetic design.

Prosthetic survival rate

The average prosthesis survival rates calculated across all studies appear to be very satisfactory. The value fluctuates between 94.6% and 100%, which corresponds to an average rate of 98.46%. These values are also those in the review by Storelli et al. very similar [18]. (97.05% for single-implant prosthesis and 98.2% for multiple-implant prosthesis). Da Silva et al. [20] also reported prosthetic survival greater than 95% in the prosthesis groups with and without lengthening. Of the 599 prostheses examined, 17 prosthetic failures were reported. In all of these cases, the only possible cause was missing implants. There were no pure prosthetic complications resulting in the loss or replacement of the entire prosthesis. Therefore, all statements regarding implant survival also apply to prosthesis survival. We note two studies by Schmid et al. Implant and prosthetic survival rates have been reported to be very high for multiple implant prosthesis [11] and single implant prosthesis [12] report a very high implant and prosthetic survival rate despite a clinical follow-up of 13 to 14 years on average with a minimum of 10 years. These two studies allow us to affirm that the extension prosthesis may be a reliable alternative in the long term. Just like the conventional implant- supported prosthesis, this success nevertheless remains dependent on the good osseointegration of the implants during the first months following the implantation.

Reported complications

Out of a sample of 599 prostheses that were examined, 160 instances of biological or prosthetic complications were documented, making for a total of 26.7%. On average, these complications occur at a rate of 9 cases per 100 prostheses per year. In terms of comparison, Storelli et al.'s review [18] indicates a total complication rate of 26.58% over a period of 5 to 10 years for implant-supported extension prostheses that are supported by at least two implants. Our observations align completely with this statistic. Observations showed a precise balance between biological and prosthetic complications, with 80 occurrences for each group. However, it was found that biological complications were more prevalent in studies that had a clinical follow-up period of over five years. Conversely, there was no discernible link between the duration of follow-up and the number of prosthetic complications. As a result, the rate of occurrence of prosthetic complications per year for 100 prostheses (5.51%) is higher than that of biological complications (3.51%).

Biological complications

There are various complications that have been reported. Out of the 599 prostheses that were examined, 26.7% or 160 cases showed either biological or prosthetic complications. On average, 9 out of every 100 prostheses experience complications each year. The occurrence of biological complications has resulted in widely varying rates across studies. Specifically, the rate ranges from 0% to 16.48% of observed complications per year of follow-up, with an average rate of 3.51% per year. Notably, only three studies, Aglietta et al. [13], Nelluri et al. [4], Roccuzzo et al. [16], reported no biological complications. These three studies also had the shortest duration of follow-up, with an average of 3, 3, and 2.8 years, respectively. On the other hand, the three studies with the lengthiest follow-up periods - Jensen-Louwerse et al. [15], Schmid

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et al. [11], and Schmid et al. [12] -exhibit a significant prevalence of biological complications. The percentage of these complications is approximately 16.48%, 3.51%, and 3.82%, respectively.

Schmid's research on multi-implant partial prostheses indicated that only 46.2% of implants were in a satisfactory state of peri-implant health after an average of 13.3 years of follow-up. Similarly, Schmid's study on mono-implant prostheses revealed that only 48% of implants exhibited a satisfactory state of peri-implant health after an average of 13.6 years of follow-up. These findings demonstrate the concerning trend of low rates of peri-implant health in both multi-implant and mono-implant prostheses, as revealed by Schmid's research. It cannot be determined that there is any other connection between the position of the prosthesis, the quantity of support, and the frequency of biological issues. This is because the other research studies display inconsistent rates for the identical prosthetic blueprint.

`Schmid et al. conducted a study on mono-implant prostheses in the anterior sector that reported a higher rate of biological complications compared to the average (3.82%) and a higher incidence of peri-implantitis than other studies. In contrast, Roccuzzo's study on the same prosthetic design found no biological complications. Last but not least, it should be emphasized that while peri-implant mucositis accounts for 77.5% of reported problems, the incidence rate of peri-implantitis is still rather low (0.59 instances of peri-implantitis per year for 100 prostheses) across all studies. All of these issues were resolved without endangering the survival of the implant or the prosthesis.

Prosthetic complications

Even more varied than biological issues seems to be the frequency of prosthetic complications. In fact, the rate of prosthetic complications per year of follow-up varied between 0% and 31.75% of prostheses. 5.51% is the average rate. With much more prosthesis problems than the other studies (31.75% versus 5.01% for the research with the second highest complication rate), the study by Nelluri et al. [4] stands out in particular. with this case, a mono-implant prosthesis with screw-retained extension is used to replace two mandibular incisors as part of a specific prosthetic design. A very high rate of denture unscrewing appears to be caused by this design. In fact, only 3 instances of the 21 prosthesis that were still functional after three years of follow-up reported no difficulties.

Three of the 15 patients who complained of the unscrewing of their prosthetics on a regular basis sought treatment for cosmetic ceramic fracture. The study of Kumari et al. [21] dealing to single-implant screw- retained extension prostheses replacing the two mandibular incisors likewise shows a very high risk of unscrewing and ceramic fracture, even though no other research included in this review address this specific kind of prosthesis. We may thus conclude that the implant-supported partial prosthesis in extension can be thought of as a trustworthy solution in light of all the facts stated in this study. Can we, however, come up with success criteria that would allow us to, within the constraints of what this review has shown, raise the survival rate of these prostheses? Success criteria and causes of failure of implant-supported partial dentures in extension:

Prosthetic design preference

Comprehensive analysis of the clinical case is crucial for making decisions in implantology. When an extension prosthesis is taken into consideration, this analysis must be even more stringent and comprehensive. There are a number of things to consider, including the type of edentulousness, the teeth that need to be replaced, the teeth that will be antagonists, the anatomy of the remaining alveolar ridges, and the existence of anatomical barriers.

Certain prosthetic designs are more vulnerable to danger than others if the prosthesis is taken into account irrespective of the site and degree of tooth loss:

*According to research by Nelluri et al. [4], a single-implant screw-retained prosthesis replacing two mandibular incisors is vulnerable to the possibility of the prosthesis coming loose. In this situation, cemented prostheses appear to be preferred. Mono-implant prostheses in extension at the level of the posterior sector tended to develop above-average biological problems, according to studies by Galal et al. [14] and Jensen-Louwerse et al. [15]. To mitigate the impact of occlusal pressures that may negatively impact peri-implant health, increasing the number of supports appears to be a wiser decision for this sector. The research in this review gives evidence that the length of the extensions is also a factor to be taken into consideration. The research reviewed in this article provides extensions with an average length ranging from 3 to 8.3 mm, another element that should be taken into account. According to an in-vitro investigation by Suedam et al. [22] the length of the extended arm has a direct correlation with the peri-implant deformation. As a result, for extension lengths longer than the period mentioned in our work, the dependability of these rehabilitations cannot be guaranteed [23-35].

Identification of risk factors

Even while certain prosthetic choices may appear trustworthy at first appearance, it is still necessary to evaluate both local and general risk variables in order to accurately predict how successful these choices will be. In fact, a number of biological and prosthetic issues that might result in the failure of the rehabilitation process can be brought on by a number of different circumstances. Among them are the following:

i. Smoking

ii. Bruxism

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iii. Periodontal disease

iv. the presence of an antagonist ceramic toothing

The importance of periodic clinical surveillance

An extension prosthesis needs specific care in the short, medium, and long term if clinical follow-up is still required in all situations of implant prostheses:

*Osteointegration may be assessed during short-term monitoring, which is the earliest sign of implant success. The initial check-up sessions also enable early care of the first issues that may be the cause of the prosthesis' prognostic worsening. The management of complications, continual surveillance of clinical and radiographic signs, and assessment of oral hygiene are the major components of medium- and long-term follow- up. During this research, we were able to see that the frequency of biological difficulties tended to rise with the duration of time the prosthesis was exposed to the oral environment. Therefore, it appears that continuous surveillance and long-term professional hygiene care are necessary to ensure the sustainability of implant-supported rehabilitations in the long term [36-46].

Limitations of the study

The main limitation was the lack of any controlled studies related to the issue. Although long- term follow-up was stated by many studies, the results were mainly supported by case reports. A deeper analysis of patients is required to understand better the relations between the cantilever and complications of implants. Further studies are required to define a specific protocol and precise recommendations on the subject of implant-supported partial prostheses with cantilever. To date, there is no classification for the different types of these designs.

Conclusion

Based on the data established by this review, we can deduce that the use of implant-supported prostheses in extension as a therapeutic solution for the management of partial edentulism represents a reliable alternative. The implant and prosthetic survival rates noted are very high, the complication rates noted remain manageable and the clinical and radiological parameters show little difference compared to conventional implant-supported prostheses.

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