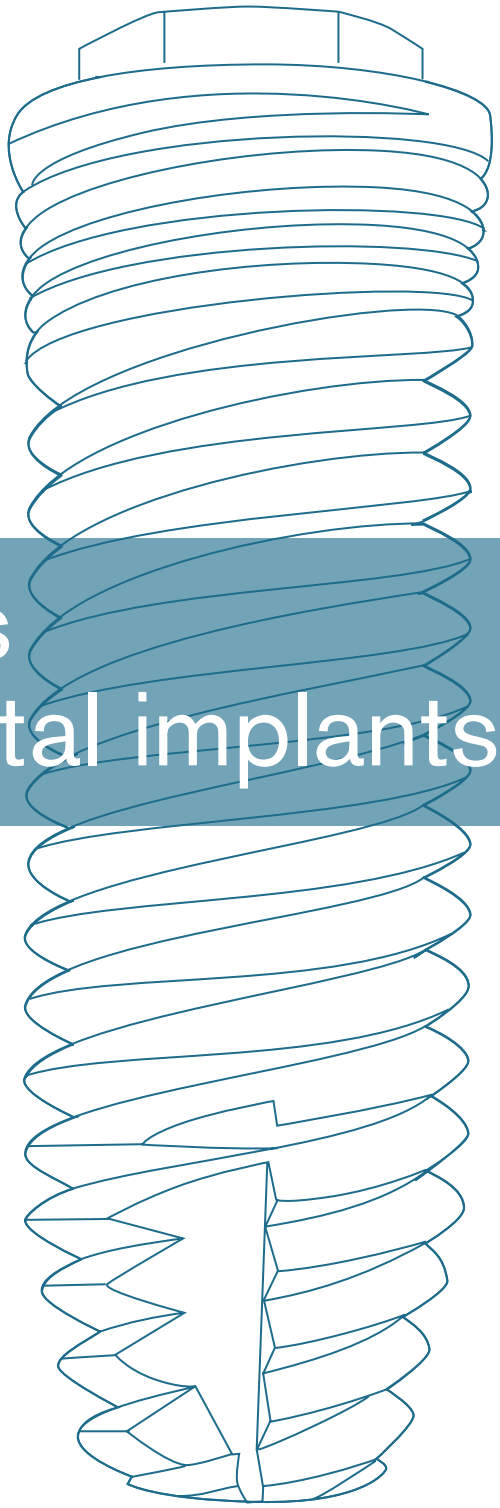
Survival analysis of AVINENT® dental implants



1.- OBJECTIVE

Long-term efficacy and safety evaluation of AVINENT® dental implants through a survival study of placed implants.

2.- MATERIALS AND EXPERIMENTAL METHODOLOGY

In the retrospective study 1043 implants were placed and then analyzed with a statistical method called a survival analysis.

This method calculates the probability of an implant failure after a given period of time.

The parameter used to determine the efficacy of an implant is the cumulative survival rate (probability that an implant will still be functioning at the end of the study) and the necessary values to perform the analysis are follow-up time and a binary variable that indicates whether it is a censored time.

2.1- Basic concepts of a survival analysis:

- **Follow-up time:** time between the follow-up beginning and a response or the end of the follow-up, if no response has occurred.
- **Start date and end date:** determines the duration of the study.
- **Date of last observation.**
- **Terminal event:** implant failure.
- **Incomplete or censored time:** if the implant has not failed by the end of the study or if the patient drops out of the study, this is considered an incomplete or censored time. (Figure 1)

2.2- Necessary values to perform a survival study:

- Follow-up time
- Binary variable to indicate whether it is a complete or censored time.

The overall survival rate (of all AVINENT® implants) can be determined and it can also be calculated based on the implant diameter, location, position, or load type.

2.3.- Method to perform the study:

The method used to calculate the probability of implant survival is the Kaplan-Meyer method. In this method, it is assumed that the terminal event is independent for each patient, i.e., that there is information about the possible implant failure for each patient.

The Kaplan-Meyer method calculates the survival time of individuals until occurrence of the event of interest, in our case implant failure, taking into account that there are cases with no implant failure at the end of the study (censored cases).

The survival rate is calculated according to the following formula:

$$\text{rate} = \frac{\text{n-r}}{\text{n-r+1}}$$

where:

n is the sample size

r is the non-censured range

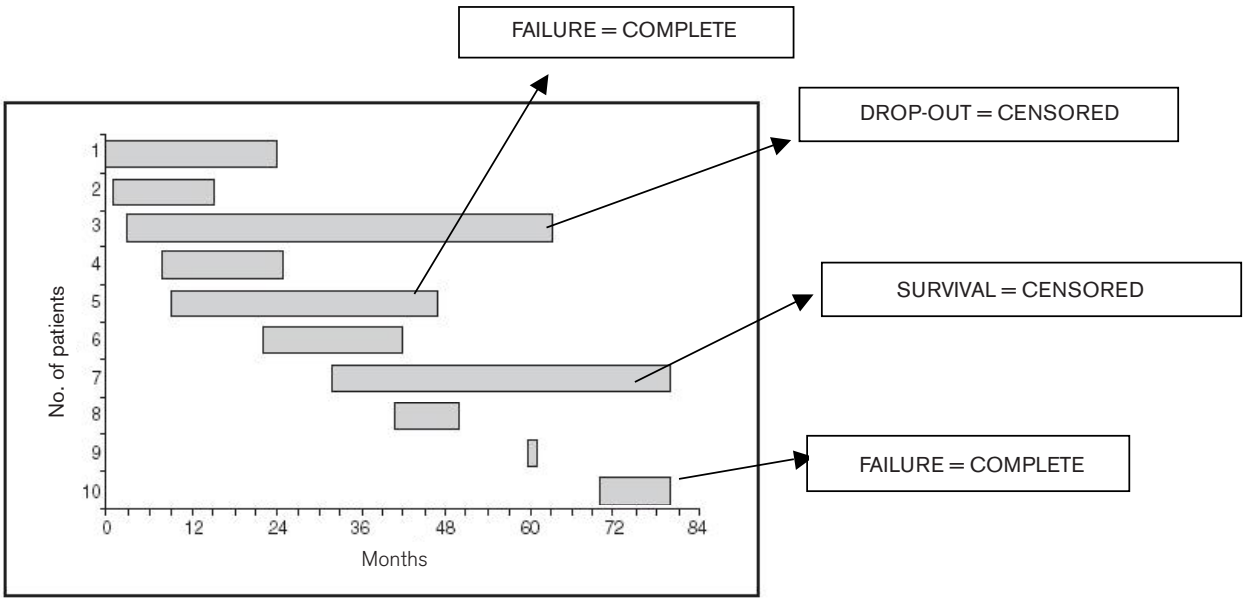


Figure 1. The survival time of an implant starts at the time it is placed in the bone and ends when it fails, or when the patient is withdrawn from follow-up.

3.- EXPERIMENTAL RESULTS

Data are available for 1043 implants placed in 855 days, 4.9% of which with a diameter of 3.3 mm, 33.2% with a diameter of 3.8 mm, 18.8% with a diameter of 4.0 mm, 30.9% with a diameter of 4.2 mm, and 12.3% with a diameter of 4.8 mm. (Figure 2)

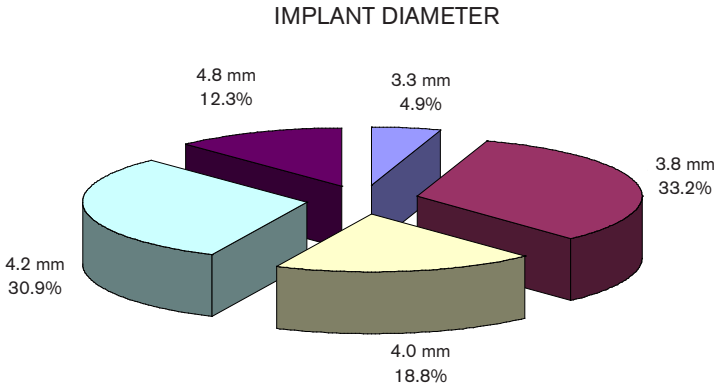


Figure 2. Classification of placed implants by diameter.

Table 1 shows the implants classification based on implant diameter and area of placement:

		DIAMETER				
	POSITION	3.3mm	3.8mm	4.0mm	4.2mm	4.8mm
MANDIBLE	Anterior	8	50	25	15	2
	Posterior	4	99	72	106	68
	Total	12	149	97	121	70
MAXILLA	Anterior	22	59	37	47	5
	Posterior	17	138	62	154	53
	Total	39	197	99	201	58

Table 1. Relationship between implant diameter and area of placement.

Table 2 shows the relationship between implant diameter and load type used:

	DIAMETER				
LOAD TYPE	3.3mm	3.8mm	4.0mm	4.2mm	4.8mm
DELAYED	47	305	166	297	120
IMMEDIATE	4	41	30	25	8
Total	51	346	196	322	128

Table 2. Relationship between implant diameter and type of load.

During the follow-up time, 7 inserted implants failed, this represents a 0.67% of the total. The cumulative survival rate at the end of the follow-up period was 98.89%. Figure 3 shows the overall survival of the AVINENT® dental implants.

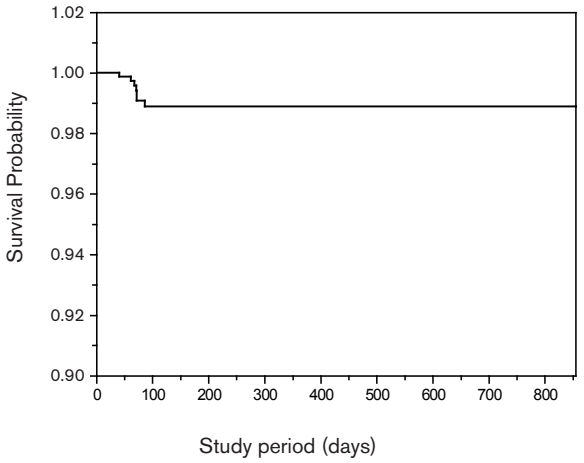


Figure 3. Graph of overall survival. At the end of the study period the calculated survival rate is 98.89% .

Figure 4 shows the survival curve for the 4 different implant diameters used. Implants with a diameter of 3.3 mm and 3.8 mm have a survival probability of 100%, implants with a diameter of 4.0 mm have a survival probability of 97.36%, implants with a diameter of 4.2 mm have a survival probability of 98.35%, and implants with a diameter of 4.8 mm have a survival probability of 98.71%.

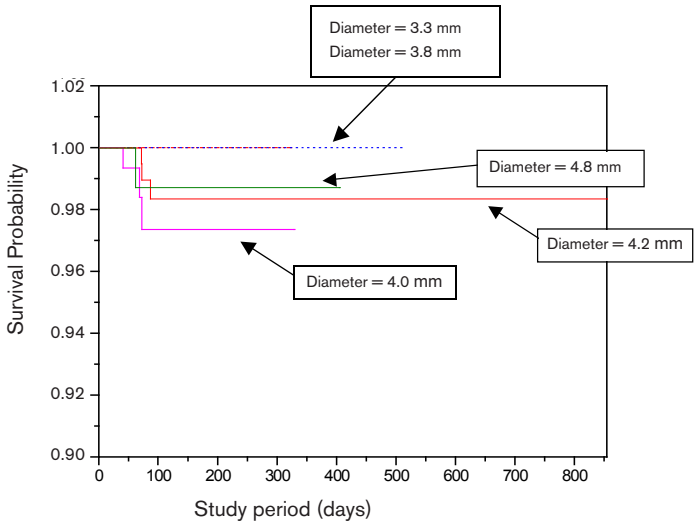


Figure 4. Probability of AVINENT® dental implants survival by diameter.

Table 3 shows the implant survival rate according to diameter, location, position, and type of load:

		n	CUMULATIVE SURVIVAL PROBABILITY (%)
DIAMETER	3.3mm	51	100
	3.8mm	342	100
	4.0mm	200	97.36
	4.2mm	322	98.35
	4.8mm	128	98.71
LOCATION	MANDIBLE	454	98.89
	MAXILLA	589	98.89
POSITION	ANTERIOR	266	98.04
	POSTERIOR	777	99.17
TYPE OF LOAD	DELAYED	935	98.95
	IMMEDIATE	108	98.24

Table 3. Survival analysis by diameter, location, position of the implant, and type of load.

4. – REFERENCES

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5. – ACKNOWLEDGMENTS

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