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# Survival of Dyna Implants: A Retrospective Study with 1 to 6 Years of Follow Up

Hamidreza Barikani[1], Mohadeseh Heidari[1*], Mohammadjavad Kharazifard[2], Amirreza Rokn[1,3]

1. Dental Implant Research Center, Dentistry Research Institute, Tehran University of Medical Sciences, Tehran, Iran
2. Dental Research Center, Dentistry Research Institute, Tehran University of Medical Sciences, Tehran, Iran
3. Department of Periodontics, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran

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**** Corresponding author:***
Dental Implant Research Center, Dentistry Research Institute, Tehran University of Medical Sciences, Tehran, Iran

Email: heidari_mohadeseh@yahoo.com

**A B S T R A C T**

**Objectives:** Dental implants are a prominent scientific breakthrough and are frequently applied for replacement of the missing teeth. From the clinicians' point of view, long-term studies are essential to find out the predictability of dental implant systems.

**Materials and Methods:** In this retrospective study, 1,626 patients who received 4,389 Dyna implants in a private office between 2013-2019 were evaluated. All statistical analyses were performed using SPSS 25 for Windows. P values less than 0.1 were considered significant for regression analysis.

**Results:** Dyna implant

ts (4389) placed from 2013 to 2019 were evaluated in this study. One-hundred and thirty-three (3.03%) implants failed during the healing period or recall visits. Eighty-nine implants (2.03%) failed immediately and 44 (1%) failed after 3 months.

**Conclusion:** The present study showed that the Dyna dental implant system had high implant survival, and it had all the survival criteria similar to world-class dental implant systems.

**Keywords:** Dental Implants; Survival; Retrospective Studies

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## INTRODUCTION

Dental implants are a prominent scientific breakthrough and are frequently applied for replacement of the missing teeth [1,2]. Since the introduction of the concept of osseointegration by Branemark and placement of the first dental implant 50 years ago [3,4], implants are increasingly used in dental offices for rehabilitation of edentulous or partially edentulous regions [5]. Several recent studies reported 90% to 98.8% survival rates for dental implants after 10 years of follow-up [6-9], and even 100% survival rate after 12 years [10]. Due to the high success rate and improvement in the quality of life of patients, today, dental implants are an ideal treatment option for replacement of the missing teeth [11]. Nowadays, more than 100 implant systems with various diameters, shapes, materials, surface properties, lengths, and geometries are available on the dental market [12-14].

The Dyna Helix implants are cylindrical screw-type implants with a root-shaped core and a straight self-tapping thread. They are fabricated from medical titanium grade 5. The DC (bone level) implant is a tripartite cylinder screw with a root form core, and dual-core self-tapping thread. The ST (bone level) implant is a dual cylinder screw with a root

form core and a self-tapping thread up to the neck of the implant, and the TM (tissue level) implant has a root form core with self-tapping thread up to the bone level area of the implant. The basic design of the Dyna Helix TM implant corresponds to that of the Dyna Helix ST implant.

From the clinicians' point of view, long-term studies are essential to assess the predictability of implant systems. It is important to differentiate between implant success and survival. Implant survival means the implant is still in dental arch regardless of patient's satisfaction while implant success points to a functional implant with patient satisfaction, immobility, and absence of peri-implant radiolucency and infection [6-9]. Hence, the aim of this single-center study was long-term evaluation of the Dyna implant system between 2013-2019.

## MATERIALS AND METHODS

In this retrospective study, 1,626 patients who received 4,389 Dyna implants in a private office between Jan. 1, 2013 to Dec. 31, 2019 were evaluated. All patients consented to the use of their data for research purposes and signed informed consent forms. Of 1,626 patients, 715 males (44%) and 911 females (56%) received treatment. All patients were healthy with no history of smoking. All implants were placed in native bone with no sinus augmentation or guided bone regeneration. The follow up time was between 1 to 84 months with a mean follow up time of 35.8±23.4 months. Implant failures were categorized based on the time of failure. Any implant failure up to 3 months after implant placement was considered as immediate failure, and all of the failures after that were categorized in delayed failure group.

Failures were diagnosed based on mobility and non-functionality of dental implants. The frequency of immediate, delayed and total failures were calculated.

The time interval between implantation and failure time was reported based on the Kaplan-Meier method. The effects of jaw, tooth type (as a 4-level ordered variable: incisors, canines, premolars, and molars), implant diameter and length (as quantitative variables), subtype of implant (binary variable: ST vs. others), and side of implant on immediate implant failure probability were evaluated using binary logistic regression. The effects of the abovementioned variables on the survival time of implants were evaluated by the Cox regression. All statistical analyses were performed using SPSS 25 for Windows. P values less than 0.1 were considered significant for regression analysis.

## RESULTS

Dyna implants (4389) placed from 2013 to 2019 were evaluated in this study. One-hundred and thirty-three (3.03%) implants failed during the healing period or recall visits. Eighty-nine implants (2.03%) failed immediately and 44 (1%) failed after 3 months. The number of implants inserted and failed immediately and totally based on the length, diameter and subtypes of implants are reported in Tables 1 to 3. According to Tables 1 and 2, the 3.6 mm implant diameter was used more than other implant diameters, and 11.5 mm implant length was used more than the other lengths.

Table 3 shows the types of implants used in this study. Bone level DC implants were used more than the other types. The mean Kaplan-Meier survival time of implants was 77.54 months (95% CI: 77.13-77.96) from 80.

**Table 1.** Distribution of implant diameter and failure in patients

| Implant diameter | Number of implants | | Immediate failure | | Total failure | |
|---|---|---|---|---|---|---|
| | Number | Percentage | Number | Percentage | Number | Percentage |
| **3.2** | 349 | 8 | 15 | 4.29 | 16 | 4.58 |
| **3.6** | 2410 | 54.9 | 59 | 2.44 | 84 | 3.49 |
| **4.2** | 1597 | 36.4 | 15 | 0.94 | 33 | 2.07 |
| **5** | 33 | 0.8 | 0 | 0 | 0 | 0 |
| **Total** | 4389 | 100 | 89 | 2.03 | 133 | 3.03 |

**Table 2.** Distribution of implant length and failure in patients

| Implant length | Number of implants | | Immediate failure | | Total failure | |
|---|---|---|---|---|---|---|
| | Number | Percentage | Number | Percentage | Number | Percentage |
| **6** | 12 | 0.3 | 0 | 0 | 0 | 0 |
| **8** | 450 | 10.3 | 6 | 1.33 | 13 | 2.89 |
| **10** | 989 | 22.5 | 18 | 1.82 | 26 | 2.63 |
| **11.5** | 1469 | 33.5 | 38 | 2.58 | 56 | 3.81 |
| **13** | 1340 | 30.5 | 25 | 1.87 | 25 | 2.61 |
| **15** | 129 | 2.9 | 2 | 1.55 | 3 | 2.33 |
| **Total** | 4389 | 100 | 89 | 2.03 | 133 | 3.03 |

**Table 3.** Distribution of implant types and failure in patients

| Implant diameter | Number of implants | | Immediate failure | | Total failure | |
|---|---|---|---|---|---|---|
| | Number | Percentage | Number | Percentage | Number | Percentage |
| **DC** | 2584 | 58.9 | 63 | 2.43 | 86 | 3.28 |
| **ST** | 1072 | 24.4 | 6 | 0.55 | 19 | 1.77 |
| **TM** | 733 | 16.7 | 20 | 2.73 | 28 | 3.82 |
| **Total** | 4389 | 100 | 89 | 2.03 | 133 | 3.03 |

The cumulative proportions of implant survival between 1 month to 6 years after implant insertion for all implants (total) and their subtypes are depicted in Figure 1.

Implant length (B=-0.095, P=0.087), Implant dimeter (B=-0.488, P=0.094), type of tooth (B=-0.180, P=0.001), and implant subtype (ST vs. other subtypes) (B=-0.639, P=0.012) had significant effects on cumulative survival function of implants, but jaw (P=0.162) and laterality (P=0.727) had no significant effects (P>0.05).

Type of tooth (B=-0.620, P=0.014) and implant subtype (ST vs. other subtypes) (B=-0.176, P=0.001) had significant effects on probability of immediate implant failure but jaw (P=0.125), implant length (P=0.117), implant dimeter (P=0.244) and laterality (P=0.804) had no significant effects.

## DISCUSSION

The aim of this retrospective study was to evaluate the survival and failure rate of Dyna implants, and the influential factors in this regard.

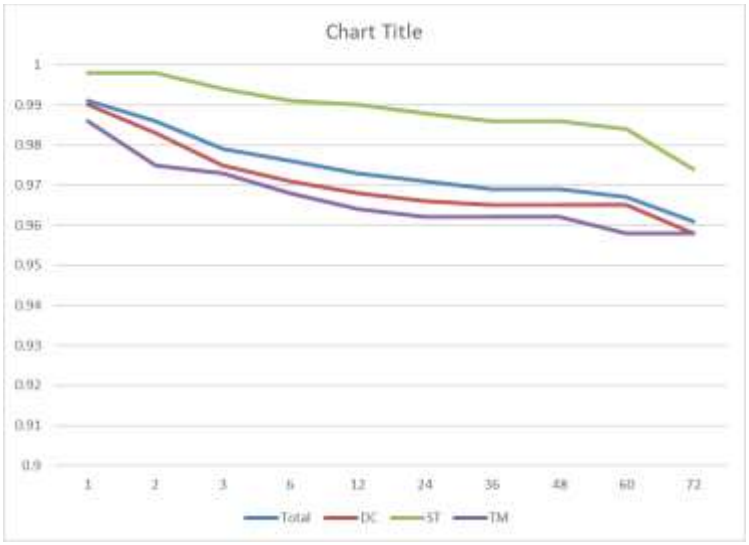


**Fig. 1.** Cumulative survival rate of Dyna implant failure and its subtypes in time intervals from 1 up to 72 months after implantation

This study showed that the Dyna dental implant system had all the survival criteria similar and comparable to world-class dental implant systems. The current study showed a 97% survival rate.

Several conditions may affect implant failure and survival, including anatomical location (maxilla or mandible), implant dimensions (diameter and length), and implant type (bone level or tissue level). With regard to implant diameter, we concluded that increasing the implant diameter decreased the implant failure. Some studies showed that narrow implants had 3.94 times higher failure rate than wider implants [15-17]; however, some studies indicated that narrower implants had similar survival rate to standard implants [18-20].

There are several factors, excluding implant diameter, that affect the survival rate of narrow implants such as the type of bone and time of loading. Since narrower implants are usually applied in compromised areas such as narrow ridges [21], case selection is very important in narrow implant survival rate. Moreover, increasing the implant diameter leads to reduced stress and strain in the jawbone especially in the alveolar crest [11] and may lead to lower failure rates.

Another factor that may affect implant survival is implant length. In our study, there were no differences in implant failure regarding implant length. Hence, we concluded that implant failure was not dependent on implant length. The concept of the relationship between short implants and failure rate is still contested [22]. Some studies showed that shorter implants had higher failure rate [15,23,24]. In contrast, other studies indicated that there was no correlation between implant length and failure [25-27].

In the current study, implant failure was more prevalent in the posterior than anterior region; however, there were no differences between the maxilla and mandible. There is controversy about the correlation of implant location and implant failure. Some studies reported a low survival rate in the maxilla [28, 29], while other studies reported that implant failure was independent of the region of implant placement [30]. One important criterion for implant follow up is changes in the marginal bone level [31]. Also, preservation of crestal bone is critical for implant success [32]. The dental community has accepted a loss of 2mm of marginal bone after loading during the first year. Moreover, after one year, tissue stability is essential for implant success and more than 0.2mm bone loss after one year is undesirable [31].

## CONCLUSION

The present study showed that the Dyna dental implant system had high implant survival, and it had all the survival criteria similar to world-class dental implant systems.

## CONFLICT OF INTEREST STATEMENT

None declared.

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