INTRODUCTION
The sufficient integration of bone and the dental implant surface, or osseointegration, is critical in dental implant treatment. The use of the appropriate drill is important for achieving clinically sufficient osseointegration. Recently, we tried to use a trephine bar for the first drilling in dental implant placement. However, no previous report has evaluated the influence of the usage of a trephine bar for dental implant placement. The usage of a trephine bar for drilling enables the histological diagnosis of bone quality and the addition of the removed bone to cover deficient bone around the implant.

In the present study, we evaluated the clinical results for dental implants placed with a trephine bar compared with those for dental implants placed with a regular drill. A total of 40 dental implants (20 patients, 7 males and 13 females) were evaluated. The experimental group consisted of 20 dental implants placed using a trephine bar, and the control group consisted of 20 implants placed using a regular drill in accordance with commercial protocol.

During clinical examination, the bone loss and gingival infection around the dental implants, mobility of the implants, and discomfort on chewing were scored and evaluated. No significant differences were found between the two groups. These results suggest that usage of the trephine bar does not influence the prognosis of postoperative dental implant placement.

Key Words: Implant placement, Surgery procedure, Trephine bar

MATERIALS AND METHODS
A total of 40 dental implants (20 patients, 7 males and 13 females) were evalu-
ated. The experimental group consisted of 20 dental implants placed using a trephine bar, and the control group consisted of 20 implants placed using a regular drill in accordance with commercial protocol (Fig. 1). The observation period was 12 months, from January 2012 to December 2013, after the connection of the superstructure. All superstructures were connected to the dental implant with a screw (15N). All implants used in the present study were Branemark System RP TiUnite Groovy® (Nobel Biocare Japan, Tokyo).

**Surgical Procedure**

In the experimental group, after disinfection and the local infiltration of anesthesia, a mucogingival incision was made with a #15 surgical knife to expose the alveolar ridge. The point of the implant placement was determined in accordance with the surgical plate. A trephine bar with an inner diameter of 2.0 mm (Implatex Japan, Tokyo) was used to prepare the implant cavity. The alveolar bone harvested by the trephine bar was preserved for bone grafting or bone quality diagnosis. A step drill 2.4/2.8 mm in diameter was then used to enlarge the hole. A drill 3.0 mm in diameter was then employed, and the implants were placed in the lower jaws after tapping the prepared holes. The surgical procedures in the control group were identical, except that a 2.0-mm diameter twist drill was used instead of the trephine bar as the first drill (Fig. 2).

In both groups, the implant placed in the upper jaw underwent secondary surgery after 6 months, and that in the lower jaw after 3 months, to connect the superstructure. All surgery was performed by two authorized oral and maxillofacial specialists.
Clinical evaluation

1) Implant type
We observed the width, length, and surface type of each dental implant.

2) Implant survival rate
We observed the survival rate (%) of the dental implants in both groups.

3) Bone loss
The bone loss around the dental implants in the both groups was measured using dental radiographic examination and scored as follows: 1: no resorption, 2: 0.0–0.5 mm resorption, 3: 0.5–1.0 mm resorption, 4: >1.0 mm bone resorption.

4) Gingival infection
The gingival infection around the dental implants was scored as follows: 3: redness (-), swelling (-), bleeding (-); 2: one (+) among redness, swelling, and bleeding; 1: two (+) among redness, swelling, and bleeding; 0: all (+) for redness, swelling, and bleeding.

5) Implant mobility
We scored the mobility of the implant as follows. Score 1: Mobility (-), Score 0: Mobility (+).

6) Chewing discomfort
We scored chewing discomfort as follows: 2: no discomfort in chewing, 1: Slight discomfort in chewing, 0: discomfort in chewing.

All scores for each subject were compared statistically using the Mann-Whitney U test. This study protocol was approved by the ethics committee of Osaka Medical College. (No.1695)

RESULTS

1) Among the implants used in the experimental group, three, six, seven, and four were 8.5 mm, 10.0 mm, 11.5 mm, and 13.0 mm in length, respectively. Among the implants used in the control group, one, one, nine, eight, and one were 7.0 mm, 8.5 mm, 10.0 mm, 11.5 mm, and 13.0 mm in length, respectively.

2) The survival rates of the dental implants in both groups were 100% (20/20 in the experimental group, 20/20 in the control group).

3) The average bone loss score around the dental implants in the experimental group was one. The average bone loss score around the dental implants in the control group was also one. No significant difference was found between the two groups (Fig. 3).

Figure 3  Peripheral radiographic assessment.
A) Bone resorption level
a) Bone resorption level
B) Distance of bone resorption.
b) Alveolar ridge height after superstructure mounted for 12 months
d) Distance of bone resorption.
4) The average score of gingival infection around the dental implants in the experimental group was three. The average score of gingival infection around the dental implants in the control group was also three. No significant difference was found between the two groups.

5) The average mobility score of the implants in the experimental group was one. The average mobility score of the dental implants in the control group was also one. No significant difference was found between the two groups.

6) The average chewing discomfort score in the experimental group was one. The average chewing discomfort score in the control group was also one. No significant difference was found between the two groups.

DISCUSSION

The osseointegration implant system introduced by Brånemark et al. allows for the recovery of high chewing function after dental implantation and has spread rapidly throughout North America and Europe from 1980\(^1,2\). This system recovers occlusal force by firmly binding the implant body surface area and alveolar bone. Accurate drilling operation is needed to achieve appropriate osseointegration.

In the conventional method of the Brånemark system, the first drilling is conducted using a twisted bar of 2 mm in the diameter. Second, a 2.4/2.8-mm diameter step drill is used to enlarge the hole. A 3.0-mm diameter twisted drill is then used, and after tapping of the prepared hole in the lower jaw, the implant is placed\(^3\).

The diagnosis of bone for implant placement has also been discussed in this system. The Hounsfield value, as measured by computed tomography (CT), is often used for bone quality diagnosis. However, X-ray systems are limited in the diagnosis of bone quality, so histological diagnosis is necessary\(^4\).

We collected an alveolar bone sample using a trephine bar with a 2.00 mm inner diameter (Implatex Japan, Tokyo). The collected bone may then be used for implantation in the area with missing bone or for histological evaluation\(^5\). The trephine bar was also used to prepare the implant cavity, thus eliminating the need for a secondary bone harvest site. There are therapeutic benefits to the usage of the trephine bar for drilling because it enables the histological diagnosis of bone quality and the addition the removed bone to cover any deficient bone around the implant.

However, no previous report has evaluated the influence of osseointegration for dental implant placement. In the present study, we evaluated the clinical results for dental implants placed with a trephine bar compared with those for dental implants placed with a regular drill. The evaluation of the survival rate of the implant for 12 months after surgery was conducted in peri-implant tissue. At 12 months after the superstructures were connected to the dental implant with a screw, no difference in the survival rate of the implant body was found between the groups. Additionally, the bone loss and gingival infection around the dental implants, implant mobility, and chewing discomfort showed no significant differences between the two groups.

Several reports have described the slow alveolar bone loss around dental implants in the osseointegrated implant system. Felice et al. observed 1.0 mm bone resorption around the implant at 12 months after surgery. Anitua et al., in experiments with short implants, reported that the absorption of the surrounding bone was 1.28 mm. These values closely correspond with our results\(^6,7\).

No significant difference in gingival infection around the implants was found between the groups. Worthington and
Brånemark have reported that peri-implant inflammation, early redness of the gums, and swelling cause bleeding and the gradual expansion of inflammation. Therefore, it is important to follow up on the inflammation of the gums at 12 months after the superstructure has been mounted. Additionally, Jemt et al. have indicated that the implant most often suffers from desorption within 12 months from the mounting of the superstructure. For these reasons, we evaluated wear to the superstructure after 12 months in this study.

The loss of implant osseointegration for any reason, including gingival infection or bone loss, causes implant mobility. Therefore, we compared the implant mobility of the two groups; we found no significant difference. We also scored chewing discomfort from the patients’ answers regarding the presence or absence of discomfort; again, no significant difference was found between the experimental and control groups.

These results suggest that the usage of a trephine bar does not influence the prognosis of postoperative dental implant placement. However, the period of this study (12 months) was relatively short. To derive a more reliable conclusion, we must conduct longer-term observations of the population.

CONCLUSION

The results of the present study suggest that the usage of a trephine bar has no impact on dental implant placement compared with regular drilling.

REFERENCES


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