Influence of Different Operatory Setups on Implant Survival Rate: A Retrospective Clinical Study

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ABSTRACT

Background: Surgery performed under sterile operating conditions, as well as atraumatic surgery, has been stated to be among the most important requirements for successful osseointegration. However, there are few reports concerning the sterile surgical technique in association with implant placement, and the appropriate level of operatory setup is not fully known.

Purpose: The purpose of this study was to analyze implant survival rate using a simplified surgical operatory setup compared with the use of the original Brånemark System® (Nobel Biocare AB, Göteborg, Sweden) protocol.

Materials and Methods: A total of 1,285 consecutively treated patients were included in the study. Four thousand implants were placed during the period of 1985 to 2003. Group A (using the Brånemark System protocol) comprised of 654 patients and 2,414 implants. Group B (using a simplified operatory setup) comprised of 631 patients and 1,586 implants. Healing was evaluated after 6 months of clinical function. Failure was defined as the removal of implants because of nonosseointegration. Statistic analysis was performed using *t*-test for paired data. The level of significance was set at 5% for comparison of data.

Results: No significant difference with regard to complications and implant survival rate was found in the study.

Conclusion: The result from the present study suggests that a simplified operatory setup does not affect the survival rate of oral implant treatment.

KEY WORDS: Brånemark System implants, implant survival, operatory setup, sterilization, Straumann implants

INTRODUCTION

Over the years, excellent success rates of osseointegrated implants have been documented in numerous studies.[1–3] Surgery performed under sterile operating conditions as well as atraumatic surgery has been stated to be among the most important requirements for successful osseointegration.[4] The original well-controlled studies made using the Brånemark System® (Nobel Biocare AB, Göteborg, Sweden) followed a certain surgical protocol regarding the operatory setup.[5–7] These guidelines are still recommended by the manufacturers of a large number of implant systems. The guidelines involve patient draping, team scrubbing and clothing, as well as sterile handling of instruments and components.[5–7]

At present, there are few reports concerning the efficacy of a sterile surgical technique in association with implant placement, and furthermore, the appropriate level of operatory setup is not fully known.[8–11] The purpose of this study was to analyze implant survival

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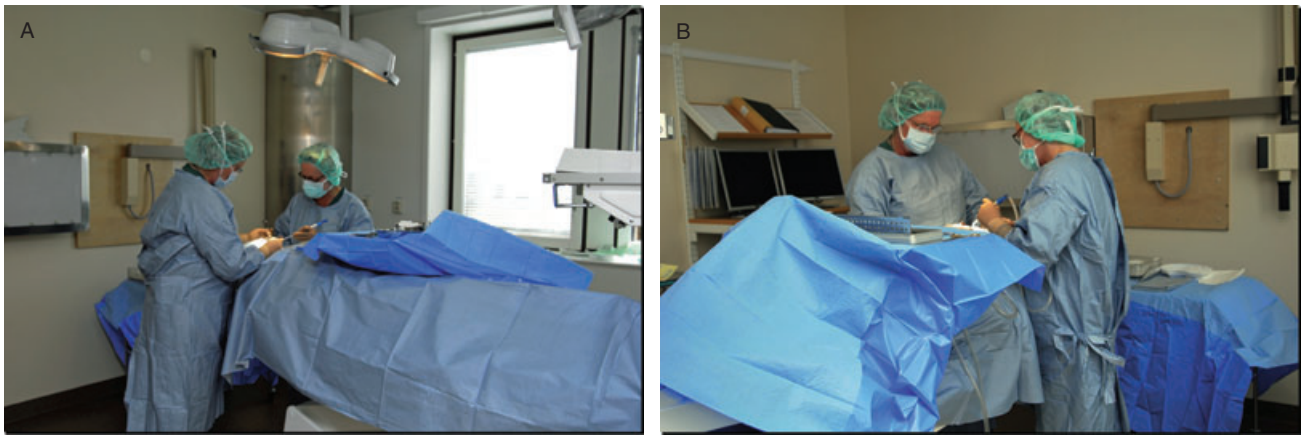

Figure 1 *A,* Operatory setup according to the original protocol. Note the sterile gowns and the sheets covering the body and the head, leaving only the mouth accessible. *B,* Operatory setup according to the original protocol from another view. Note the extensive sheets covering the entire body of the patient.

rate using a simplified surgical operatory setup compared with the use of the original Brånemark System protocol.

MATERIALS AND METHODS

Patients consecutively treated at the Department of Oral & Maxillofacial Surgery, NÄL, Trollhättan, Sweden, were included in the study. All patients received antibiotic prophylaxis and all instruments and irrigation solutions were sterile. Drapes of different sizes and plastic covers were used to drape the equipment. The surgeons wore sterile gloves. Between 1985 and 1997, all patients were draped with sterile operating sheets covering the body and the head, leaving only the mouth accessible. The surgeons wore sterile gowns (see Figure 1, A and B) (Group A). From to 2003, which was the termination date for the present study, the routine changed and the surgeons no longer wore sterile surgical gowns. The patients were draped with a smaller sterile drape, covering the chest and a head drape, leaving the mouth accessible (Group B) (see Figure 2). Patients with a general disease or requiring zygomatic fixtures as well as Novum implants were excluded from the study. No patients receiving bone graft or guided bone regeneration procedures were included in the study.

A total of 1,285 patients were included in study (661 men, 624 women). The mean age was 52.8 (range 15–92 years). A total of 4,000 implants were installed during the period of 1985 to 2003. Two implant systems were used. The Brånemark System and Straumann (Straumann AG, Waldenburg, Switzerland). The implants were installed according to the standard protocol recommended by the manufacturer for the respective system used, except in Group B were alterations were made in the operatory setup (as described above). Two thousand four hundred fourteen implants were placed according to the protocol for Group A (2,360 Brånemark implants and 54 Straumann). Group B comprised of 1,586 implants (683 Brånemark implants and 903 Straumann). Healing was evaluated after the recommended healing period at the time of prosthetic rehabilitation. Postoperative infections during healing were recorded. Failure of implants was defined as nonosseointegrated implant according to the criteria of success described by Albrektsson and colleagues.[2] Statistical analysis was performed using *t*-test for paired samples. The level of significance was set at 5% for comparison of data.

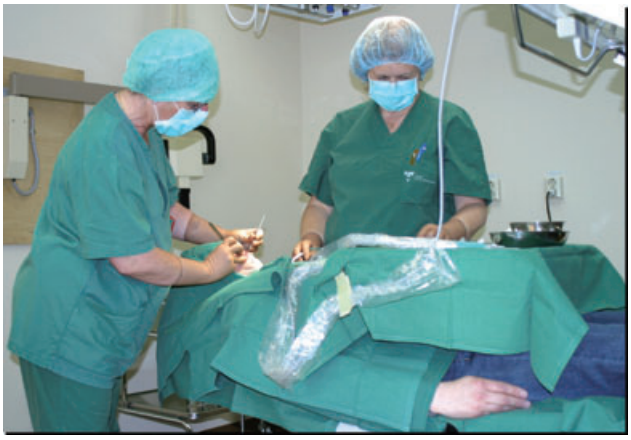

Figure 2 Operatory setup according to the modified protocol. The surgeon and assistant are wearing scrubs and sterile gloves. Note the smaller sterile drape covering the chest of the patient and a head drape, leaving the mouth accessible.

TABLE 1 All Implants Inserted between 1985 to 1997 (Group A) Were Inserted Using the Original Brånemark System Protocol

Implant System	Successful Number of Implants	% Successful Implants	Failed Number of Implants	% Failed Implants	Total Number
Brånemark System	2,281	96.6	79	3.4	2,360
Straumann	51	94.4	3	5.6	54

No statistical difference was found between the groups regarding implant survival.

RESULTS

Generally, few complications were seen in the present material. Postoperative swelling and edema was noted but considered to be a normal postoperative event. No postoperative infections were noted. Overall, out of a total of 4,000 implants placed, 127 were lost during the time of evaluation. In Group A, 82 implants failed out of 2,414 corresponding to an implant survival of 96.6%. In Group B, a total of 45 implants out of 1,586 failed to integrate and hereby representing an implant survival rate of 97.2% at the time of prosthetic rehabilitation start.

No statistical significant difference was seen between the two groups. Also, between the respective implant system used, no statistical significant difference was found with regard to survival rate. For details, see Tables 1 and 2.

DISCUSSION

Osseointegrated implants have evolved into a predictable treatment for replacing teeth as numerous publications have shown excellent high long-term survival rates.[1–3] In the present study, a high implant survival rate was seen in both Group A and Group B, which is in accordance to other authors.[1–3] The failures were mostly located in the maxilla, which is also similar to reports in the literature.[1–3] Reasons for implant failures have been widely discussed in the literature. In 1999, Esposito and colleagues[4] found that one of the three major etiologies for failure of oral implants might be infections associated with the surgical procedure. Persson and colleagues[12] found a flora that consisted mainly of facultative and anaerobic streptococci, gram-positive rods, actinomyces species, and gram-negative anaerobic rods while studying bacterial colonization on implant components. It was suggested that the presence of bacteria is the result of contamination of the fixture and abutment components during the first and/or second stage of implant installation, and/or by transmission of microorganisms from the oral environment during function following bridge installation.[12] Listgarten[13] stated that bacterial colonization of dental implants can occur at the time of implant placement on the external implant surfaces and also on the internal surfaces such as occlusal screw holes, which was proven by Quirynen and colleagues.[14] The infection may later become reestablished at the time of abutment connection at the junction of the fixture and abutment.[13,14] In another study, Rosenberg and colleagues[15] found that fixture loss resulting from infection occurred most often between initial placement and second-stage surgery, whereas failure in the absence of infection occurred primarily after the insertion of the final prosthesis.[15] The importance of a sterile environment during surgery is known; however, its value in implant placement has been discussed during the recent years. Furthermore, there are few reports concerning the appropriate level of operatory setup during implant placement.[8–11] Scharf and Tarnow[11] reported no difference on implant success rate when comparing a clean versus sterile

TABLE 2 All Implants Inserted between 1999 to 2003 (Group B) Were Inserted Using a Simplified Operatory Setup

Implant System	Successful Number of Implants	% Successful Implants	Failed Number of Implants	% Failed Implants	Total Number
Brånemark System	659	96.5	24	3.5	683
Straumann	882	97.7	21	2.3	903

No statistical difference was found between the groups regarding implant survival.

technique in a study including a total of 386 implants. Osseointegration was judged at stage 2 surgery.[11] In another study, Bernard and colleagues[9] compared a sterile group to an aseptic one. A total of 850 implants were inserted, and both groups showed success rates over 99% at the time of abutment connection.[9] Kraut[10] stated that excellent results from implant treatment could be obtained in dental offices carried out with clean standards. In contrast, Friberg[8] recommended the use of the original protocol in a review article to limit the risk of contamination of the implant. This, especially in the hands of dentists recently introduced into the field of implantology, the sterile technique providing safety while handling sterile components.[8] A simplified operatory setup in implant surgery procedure reduces the time and cost of the treatment, a fact that may give a larger group of patients the chance of implant treatment. Another aspect is the environmental point of view when considering the amount of gowns and drapes that are presently used in a large number of clinics. The number of implant surgery procedures performed during 1 year globally is considerable. The present study has evaluated the use of a simplified operatory setup compared with the original Brånemark protocol. More advanced procedures such as guided bone regeneration, zygoma implants, and bone grafting procedures were excluded from the study because of the fact that these are considered more technique sensitive and logically have a higher risk for complications. The outcome of routine implant treatment was analyzed retrospectively. In the respective groups, the success rates were 96.6 and 97.2% for implant survival at the time of prosthetic rehabilitation. This demonstrates that a simplified operatory setup as exemplified in this study is a safe protocol for routine implant treatment.

CONCLUSION

The results from the present study suggest that a simplified operatory setup is sufficient and does not affect the survival rate of oral implant treatment and therefore can be recommended.

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