

A Retrospective Follow-up of 50 consecutive patients treated with Neoss Implants with or without an Adjunctive GBR-Procedure

Thomas Zumstein¹ and Camilla Billström²

¹ Dr. med. dent., Private practice, Luzern, Switzerland

² Neoss AB, Mölnlycke, Sweden

This retrospective study of 50 patients and 183 Neoss implants showed a survival rate of 98.2% for routine cases and 94.4 % for GBR cases after a follow-up of 1 to 2 years. The marginal bone loss was 0.3 mm the first and 0.1 mm the second year. GBR procedures involving short implants and soft bone seemed to increase the risk of implant failure.

INTRODUCTION

The use of osseointegrated implants has been proven to result in good clinical outcomes in the prosthetic rehabilitation of the edentulous patient, whether used in totally or partially edentulous jaws, including single tooth replacements (Esposito et al. 1998). Since the introduction some 40 years ago, the osseointegration technique has been continuously developed and refined in order to simplify and shorten implant treatment. For instance, the introduction of self-tapping implants, surface modifications and immediate/early loading protocols has markedly facilitated implant treatment. The presence of sufficient bone volumes was originally an absolute criterion for using implants. Today, numbers of reconstructive techniques including the use of bone grafts, bone substitutes, osteodistraction devices and membranes are available to increase the load-bearing volume of the jaw bone. A localized defect such as that due to incomplete healing after extraction may complicate the placement of an implant by exposure of parts of the implant. In such cases, the use of a bovine bone substitute and a resorbable membrane is commonly used to achieve complete bone coverage (Hurzel et al. 1998, Hammerle & Lang 2001).

The Neoss implant system (Neoss Ltd, Harrogate, UK) is a novel design which according to the manufacturer was developed to provide simple and effective solutions for all kinds of cases with minimal components. Special attention has been paid to the technical/prosthetic phase and only one prosthetic platform is used irrespective of implant diameter.

The aim of this retrospective study was to report on the experiences with Neoss implants from the first consecutive 50 patients treated in one private office.

MATERIALS AND METHODS

Patients and surgery

Fifty consecutive patients (20 males, 30 females, mean age 57 years) needing implant treatment were enrolled in the study. Three patients were treated in both maxilla and mandible resulting in 53 treatment areas (jaws) included in the study. Intraoral and panoramic radiographs as well as CT scans were used for presurgical evaluations. Nine patients were totally edentulous (two in both jaws), 21 were partially edentulous (one in two areas) and 20 patients were treated for single tooth loss.

The patients were administered antibiotics prior to surgery (Dalacin® C 300mg, Pfizer). Surgery was performed under sterile conditions and local anaesthesia with Ultracain® DS Forte. Crestal incisions were used and implant sites were drilled in accordance with the guidelines given by the manufacturer for the appropriate implant diameter. Implants were inserted into position with a drilling unit. A total of 183 Neoss implants (Neoss Ltd, Harrogate, UK) were placed; 116 in the maxilla and 67 in the mandible (Table 1). Implant lengths and diameters are shown in Table 2 and 3. Bone quality and quantity according to the Lekholm and Zarb index (1985) were registered (Tables 4 and 5). The implant collar was either fully submerged in bone (n=1087) or to half its length (n=75).

Thirty of the treatment areas with 126 implants underwent GBR using BioOss™ and a resorbable BioGide™ membrane (Geistlich, Switzerland) simultaneously with implant placement.

Healing abutments were connected after a healing period of 3 to 6 months in 32 treatment areas (89 implants). In 21 areas (94 implants) healing

MAXILLA	28	27	26	25	24	23	22	21	11	12	13	14	15	16	17	18	TOTAL
	0	1	11	16	17	9	6	4	4	7	9	12	12	7	1	0	116
	0	3	9	5	3	4	5	1	2	6	5	5	6	11	2	0	67
MANDIBLE	38	37	36	35	34	33	32	31	41	42	43	44	45	46	47	48	TOTAL

Table 1. Distribution of implants in relation to position

abutments were placed in conjunction with implant surgery and 8 of these (57 implants) were loaded with a crown/bridge for immediate function.

Table 2. Placed and failed implants in relation to length

IMPLANT LENGTH	PLACED IMPLANTS	FAILED IMPLANTS IN TOTAL	FAILED IMPLANTS IN GBR PATIENTS	FAILED IMPLANTS IN NON-GBR
7 mm	7	2	2	0
9 mm	51	4	3	1
11 mm	75	2	2	0
13 mm	44	0	0	0
15 mm	6	0	0	0
17 mm	0	0	0	0
Total	183	8	7	1

Table 3. Placed and failed implants in relation to diameter

IMPLANT DIAMETER	PLACED IMPLANTS	FAILED IMPLANTS IN TOTAL	FAILED IMPLANTS IN GBR PATIENTS	FAILED IMPLANTS IN NON-GBR PATIENTS
3,5 mm	58	5	4	1
4,0 mm	112	2	2	0
4,5 mm	13	1	1	0
5,5 mm	0	0	0	0
Total	183	8	7	1

Table 4. Placed and failed implants in relation to bone quality

BONE QUALITY	PLACED IMPLANTS	FAILED IMPLANTS IN TOTAL	FAILED IMPLANTS IN GBR PATIENTS	FAILED IMPLANTS IN NON-GBR
1	0	0	0	0
2	47	2	2	0
3	115	4	4	0
4	21	2	1	1
Total	183	8	7	1

Prosthetics

Impressions were taken on implant level for screw-retained prosthetics using Neolink abutments (Neoss Ltd, Harrogate, UK) and gold-ceramic or gold-acrylic frameworks. All crowns and partial bridges were gold-ceramic reconstructions and all but one of the full jaw bridges were gold-acrylic reconstructions. The crowns/bridges were attached with gold screws using a preload of 32 Ncm.

Follow-up

The patients were scheduled for annual check-ups with clinical and radiographic examinations using intraoral or panoramic radiographs. Marginal bone level measurements were performed by an independent radiologist in one baseline and one follow-up radiograph.

RESULTS

Forty-nine of the patients attended the first annual check up and 26 the second. A total of eight implant failures were registered, all during the first year in service, giving an overall Cumulative Success Rate (CSR) of 95.6% (Table 6). All but one failure occurred in the GBR group, giving a CSR of 94.4% for the GBR-group and 98.2 % for the non-GBR group after 1 year (Table 6). The characteristics of failed implants are shown in Table 7. Failures occurred

Table 5. Placed and failed implants in relation to bone quantity

BONE QUANTITY	PLACED IMPLANTS	FAILED IMPLANTS IN TOTAL	FAILED IMPLANTS IN GBR PATIENTS	FAILED IMPLANTS IN NON-GBR
A	44	0	0	0
B	103	4	4	0
C	26	4	3	1
D	10	0	0	0
E	0	0	0	0
Total	183	8	7	1

more often for short implants and in soft bone. In spite of the failures, all patients received and maintained a fixed crown/ bridge during the follow-up.

A total of 270 radiographs could be used for measurements of marginal bone levels. On average, the bone was situated 1.6 (S.D. 0.75) mm below the top of the collar at baseline and 1.9 (S.D. 0.73) mm at the follow-up one year later. Thus, the total bone loss amounted to 0.3 (S.D. 0.88) mm (Table 8) during this year. There were only small differences between the GBR and non-GBR groups.

DISCUSSION

The experiences with the Neoss implant system from the first 50 patients treated in one clinic are reported. A survival rate of 98.2 % was achieved after one to two years in routine cases with no need for bone augmentation procedures. This is in accordance with recent studies on other implant systems (Albrektsson & Wennerberg, 2004). The implant that failed in this group was of 3.5 mm diameter with length 9 mm placed in quality type 4 bone in the maxilla. It was one of 8 implants placed with an immediate loading protocol for a full bridge reconstruction. A higher failure rate was seen when implants were placed with a simultaneous GBR procedure using bovine bone and a resorbable membrane, as 7 of 126 implants were lost (5.6%). The results indicate that osseointegration of the exposed parts of the implants was not achieved for these implants during healing prior to loading, resulting in an unfavourable biomechanical situation. This notion is further supported by the fact that short implants (7 and 9 mm) and implants in soft bone quality failed more often. It is possible that a prolonged healing period is needed, as also suggested for sinus lift procedures with bovine bone (Hallman et al. 2005).

Table 6. Life-tables

TOTAL	SURVIVING IMPLANTS	FAILED IMPLANTS		CSR (%)
Implant placement – Prosthesis delivery	183	2	0	98.9%
Prosthesis delivery – 1 year	181	6	0	95.6%
1 year – 2 years	175	0	14	95.6%
2 years – 3 years	93	0	6	95.6%
3 years	13	-	-	-

GBR GROUP	SURVIVING IMPLANTS	FAILED IMPLANTS	WITHDRAWN IMPLANTS	CSR (%)
Implant placement – Prosthesis delivery	126	2	0	98.4%
Prosthesis delivery – 1 year	124	5	0	94.4%
1 year – 2 years	119	0	8	94.4%
2 years – 3 years	60	0	8	94.4%
3 years	11	-	-	-

NON-GBR GROUP	SURVIVING IMPLANTS	FAILED IMPLANTS	WITHDRAWN IMPLANTS	CSR (%)
Implant placement – Prosthesis delivery	57	0	0	100%
Prosthesis delivery – 1 year	57	1	0	98.2%
1 year – 2 years	56	0	6	98.2%
2 years – 3 years	33	0	0	98.2%
3 years	2	-	-	-

Table 7. Characteristics of failed implants

PATIENT NUMBER	POSITION	LENGTH	DIAMETER	BONE QUALITY	BONE QUANTITY	GBR	TIME OF FAILURE
2865	22	9	3.5	3	C	Yes	Prosthesis
1896	23	9	3.5	3	C	Yes	Prosthesis
47	15	11	4.5	4	C	Yes	1 year
154	36	7	3.5	2	B	Yes	1 year
154	44	7	3.5	3	B	Yes	1 year
1454	35	11	4.0	2	B	Yes	1 year
1454	25	9	4.0	3	B	Yes	1 year
2782	26	9	3.5	4	C	No	1 year

	BONE LEVEL BASELINE	BONE LEVEL 1 YEAR FOLLOW-UP VISIT	BONE LEVEL 2 YEAR FOLLOW-UP VISIT	BONE LOSS BASELINE TO 1 YEAR	BONE LOSS 1 YEAR TO 2 YEAR
Mean	1.60	1.90	2.28	0.30	0.09
S.D.	0.75	0.73	0.70	0.88	0.74
N	80	76	60	56	22

Table 8. Marginal bone level measurements

Due to the retrospective character of the present study, radiographs could not be provided for all implants. Prospective studies with radiographs of consecutive implants are needed to properly evaluate marginal bone levels. Nevertheless, the marginal bone measurements indicated an acceptable degree of bone loss during follow-up. The average marginal bone level at follow-up was still situated at the implant collar. For the Brånemark implant design, the marginal bone level usually ends up at the first thread some 1.5 to 2 mm below the platform (Oh et al, 2002). Other implant designs have shown only minor bone loss which may be due to micro threads on the collar (Shin et al. 2006) Too few radiographs were available to evaluate the influence of countersink depth of the implant collar on marginal bone loss.

The clinical experiences with the present implant system from a surgical, prosthetic and laboratory technician point of view were positive. The implant design resulted in firm primary stability in all bone qualities. This is probably due to the geometry of the implant, which has a positive tolerance and is thereby slightly tapered. During insertion the bone is compressed in a lateral direction which increases the stability of the implant. Internal connection is an advantage as it makes abutment connection easy. Impressions are taken on implant level and the technician chooses the type of abutment, which in case of screw-retained prosthetics is integrated with the framework.

CONCLUSIONS

Within the limitations of the present retrospective study, it is concluded that the Neoss implant system results in good clinical outcomes in routine cases as evidenced by survival rate and marginal bone loss. GBR procedures involving short implants and soft bone seem to increase the risk of implant failure.

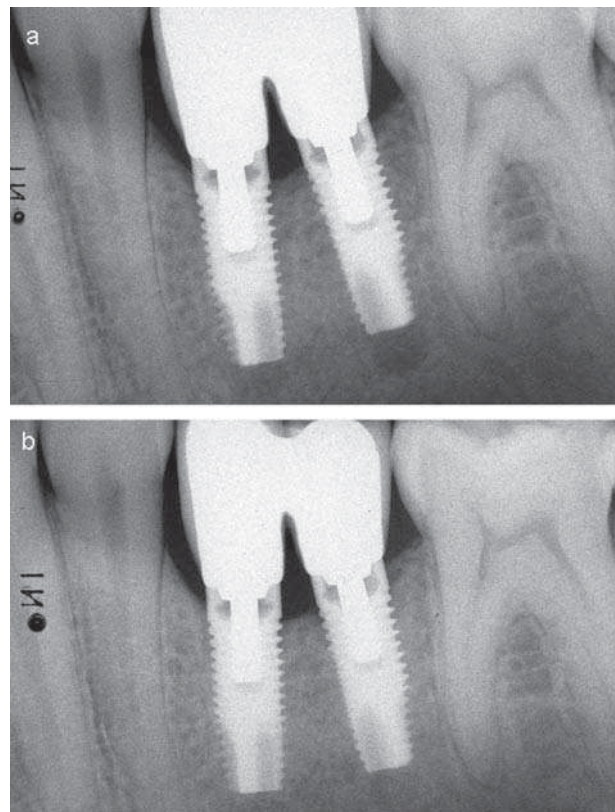


Figure 1. Periapical radiographs taken after delivery of a two-unit bridge and after one year of loading.

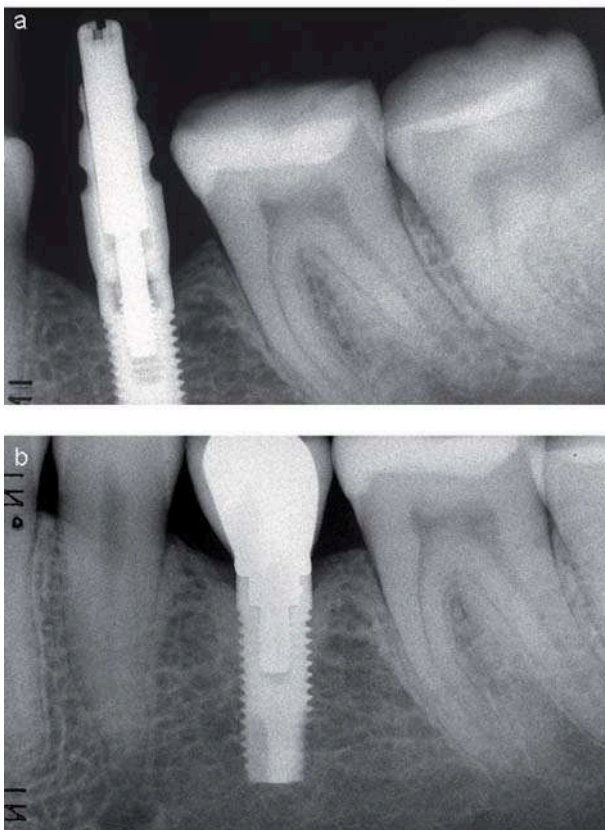


Figure 2. Periapical radiographs of a single tooth restoration at impression taking and after one year of loading

REFERENCES

- Albrektsson T, Wennerberg A. Oral implant surfaces: Part 2--review focusing on clinical knowledge of different surfaces. *Int J Prosthodont.* 2004 Sep-Oct;17(5):544-64.
- Esposito M, Hirsch JM, Lekholm U, Thomsen P. Biological factors contributing to failures of osseointegrated oral implants. (I). Success criteria and epidemiology. *Eur J Oral Sci.* 1998 Feb;106(1):527-51.
- Hallman M, Hedin M, Sennerby L, Lundgren S. A prospective 1-year clinical and radiographic study of implants placed after maxillary sinus floor augmentation with bovine hydroxyapatite and autogenous bone. *J Oral Maxillofac Surg.* 2002 Mar;60(3):277-84.
- Hammerle CH, Lang NP. Single stage surgery combining transmucosal implant placement with guided bone regeneration and bioresorbable materials. *Clin Oral Implants Res.* 2001 Feb;12(1):9-18.
- Hurzeler MB, Kohal RJ, Naghshbandi J, Mota LF, Conradt J, Huttmacher D, Caffesse RG. Evaluation of a new bioresorbable barrier to facilitate guided bone regeneration around exposed implant threads. An experimental study in the monkey. *Int J Oral Maxillofac Surg.* 1998 Aug;27(4):315-20.
- Lekholm U, Zarb GA. Patient selection. In: Brånemark P-I, Zarb GA, Albrektsson T, eds. *Tissue integrated prostheses. Osseointegration in clinical dentistry.* Chicago: Quintessence, 1985:199-209.
- Oh TJ, Yoon J, Misch CE, Wang HL. The causes of early implant bone loss: myth or science? *J Periodontol.* 2002 Mar;73(3):322-33.
- Shin YK, Han CH, Heo SJ, Kim S, Chun HJ. Radiographic evaluation of marginal bone level around implants with different neck designs after 1 year.