

### ***Acceptance and Rejection Evaluation Study of 65 Consequently Placed Single Crown Implants in a Population of Non-Smokers and Smokers***

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***Acceptance and Rejection Evaluation Study of 65 Consequently Placed Single Crown Implants in a Population of Non-Smokers and Smokers.***

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The study comprises of 45 TPS Coated Cylinder Shaped Push-In Implants and 20 Screw Type Self Tapping Implants consequently placed at the, Hymysuu Private Dental Clinic Registered for Research and Treatment , Lahti Finland. Stage I and Stage II were done under local anaesthesia and the study included the making of PFM crowns and their annual check-ups.

The implants, abutments and all prosthetic elements were manufactured by the company Hi-Tec, Herzlia Israel.

The objective of the study was to present the incidence of fixture failures in groups of smokers in comparison to non-smokers using TPS Coated Cylinder Shaped Push – In Implants and Screw Type Self Tapping Implants.

The retrospective study was conducted on patients treated at the Hymysuu Private Dental Clinic Registered for Research and Treatment and comprised 65 implants consequently placed over a period of 8 years in 63 patients with single tooth missing.

The patients' need for implants was based on :

1. Aesthetic need for missing a tooth in the frontal section of the maxilla or mandible.
2. Functional disturbance of missing a tooth in the molar or premolar region.
3. The unwillingness of having natural teeth to be used as supporting structures for fixed bridges.

Surgery was performed by Maxillae Facial Surgeon and DDS experienced in implant surgery. The prosthetic treatment was done by several DDS with varied experience in prosthetics.

Implants versatile range of osseointegration implants are based on :

- 1.a. Titanium Plasma Spray Coated Cylinder Shaped Push-In Implants.
- b. HA(hydroxyl apatite) Coated Cylinder Shaped Push-In Implants
- 2.a. Self-Tapping Screw Titanium Implants
- b. Self-Tapping Screw Titanium Implants with Roughened Surface

All Cylinder Shape Implants used in the study were TPS coated expect for 2 HA Coated Cylinder Shape Implants. Eight of the Self Tapping Screw Titanium Implants had Roughened Surface.

Five (5) implants failed (7.69%).Two (2) of them in the group of Smokers (18.18%) and three (3) in the group of Non-Smokers(5.76%).

### **Materials and Methods**

The Study consists of 45 consequently placed TPS or HA Coated Cylinder Shaped Push-In Implants and 20 Polished or Roughened Self-Tapping Screw Implants placed in 63 patients : Non-Smokers 54 (85.71%) and Smokers 9 (14.29%)

After routine medical, dental and radiographic assessment (including a panoramic radiograph) each patient was evaluated for implant treatment. Then the feasibility of the treatment plan and alternative solution (e.g. fix prosthetics) and possible risks and failures were discussed with each patient, and decision for the procedure was made.

All implants were installed by surgical procedure and aseptic technique.

The surgical procedure consists of two stages :

Stage I – Insertion of Implant.

Stage II – Exposure of Cover Screw after 4-6 months.

Surgical placement of the implants was based on the following procedure : The patient was placed under local anaesthesia. A mid-crestal, buccal or labial incision was made, depending upon the site of the intended implant, and flap was lifted exposing the underlying bone. An osteotomy was performed with internally irrigated drills, using sterile physiological water. The implant was placed in the prepared site, and the flaps were closed by suture. Perioperative chemotherapy was used, that is antibiotics and chlorhexadine.

Stage II was performed under local anaesthesia 4- 6 months after Stage I. This entailed opening a flap, exposing the cover screw and replacing it with a Titanium 3mm or 5mm Healing Cap.

PFM crowns were either cemented or screw retained and they were constructed on angulated (15 or 25 degrees) or strait abutments.

The Cylinder Shaped Fixtures are made from Medical Grade Titanium Alloy and coated either with Pure Titanium Plasma Spray Coating or 50 Microns Hydroxyl Apatite.

The Self Thread Implants are made from either Polished or Roughened Medical Grade Titanium Alloy.

Various length implants were used.

## Results

The distribution of the lenght of the implants is seen in Table 1.

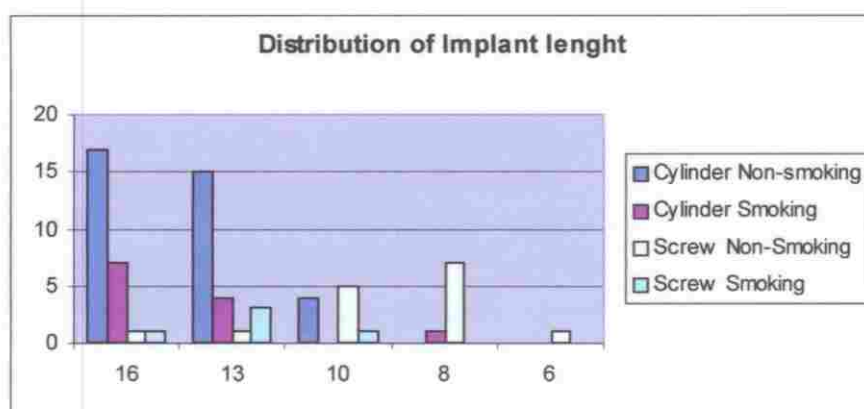


Table I

During this 8 year period Stage I surgeries were performed on 63 patients: 33 (52.38%) of the patients were female and 30 (47.62%) of the patients were male. Eleven (11) of them were Smokers and 52 Non-Smokers.



Five (5) of the Smokers were female and six (6) of them male.

Female Smokers lost 1 implant (20%) and Female Non-Smokers lost 2 implants (7.69%). Male Smokers lost 1 implant (16.67%) and Male Non-Smokers lost 1 implant (3.57%).

Female Smokers had 1 failure (50%) with Cylinder Shape Implants and Female Non-Smokers 2 failures (9.5%) with Cylinder Shape Implants. Male Smokers had 1 failure (25%) with Cylinder Shape Implants and Male Non-Smokers had 1 failure (5.6%) with Cylinder Shape Implants. There was no failures with Self Tapping Screw Titanium Implants.

Table II

SCREW	Non-Smoking				Smoking				
	Surviving		Failed		Surviving		Failed		
	N	%	N	%	N	%	N	%	
Female	7	100	0	0	3	100	0	0	10
Male	8	100	0	0	2	100	0	0	10
TOTAL	15	100	0	0	5	100	0	0	20

CYLINDER	Non-Smoking				Smoking				
	Surviving		Failed		Surviving		Failed		
	N	%	N	%	N	%	N	%	
Female	19	90,5	2	9,5	1	50	1	50	23
Male	17	94,4	1	5,6	3	75	1	25	22
TOTAL	36	92,3	3	7,17	4	66,67	2	33,3	45

TOTAL									
Female	26	92,31	2	7,69	4	80	1	20	33
Male	25	96,43	1	3,57	5	83,33	1	16,67	32
Total	51	94,44	3	5,56	9	81,82	2	18,18	65

In the maxilla were placed 52 fixtures: 40 Cylinder Shaped Push-In and 12 Screw Type Self Tapping Implants. 35 of the Cylinder Shaped and 9 of the Self Thread fixtures were placed in non-smokers and 5 Cylinder Shaped and 3 Self Thread in smokers. 3 Cylinder Shaped Implants failed in non-smokers and 1 Cylinder Shaped Implant failed in smokers.

There were no failures in Self Thread Implants. 13 fixtures were placed in the mandible : 6 Cylinder Shaped Push-In Implants and 7 Screw Type Self

Tapping Implants. 5 Cylinder Shaped and 6 Self Thread fixtures were placed in non-smokers and 1 Cylinder Shaped and 1 Self Thread were placed in smokers. 1 Cylinder Shaped Implant failed in smokers.

Non-smokers did not loose any implants in the mandible.

Table III

	Non-Smoking				Smoking			
	Surviving		Failed		Surviving		Failed	
	cylinder	Self thread	cylinder	Self thread thread	cylinder	Self thread	cylinder	Self thread
Mandible	5	6	0	0	0	1	1	0
Maxilla	31	9	3	0	4	3	1	0
TOTAL	35	15	3	0	4	4	2	0

In mandible and maxilla the survival rate for implants was 94,4% for non-smoking patients and the survival rate for smokers was 81,82.

In mandible the survival of implants was 100% for non-smokers and for smokers 50 %.  
In maxilla the survival of implants was 93% for non-smokers and for smokers 87.5%.

In mandible the survival of self thread implants was 100% for both non-smokers and smokers.

In maxilla the survival of self thread implants was 93,19% for non-smokers and 87,5% for smokers.

In mandible success for cylinder implants was 100% for non-smokers and for smokers 0  
In maxilla survival for cylinder implants was 91.43% for non-smokers, and for smokers 80%.

At the time of stage I surgery, patients' health status was recorded and patients were assigned to one of three groups corresponding to the American Society of Anaesthesiologists (ASA) physical status. Patients were designated as 1(healthy), 2(mild systemic disease), or 3(severe systemic disease that is not incapacitating). ASA 1 include 45 non-smokers and 11 smokers. ASA 2 include 9 non-smokers and 0 smokers. ASA 3 included nobody.

Table IV.

ASA				
	ASA I	ASA II	ASAIII	
Non-smokers	45	9	0	
Smokers	11	0	0	
Total	56	9	0	65

The proportion of smokers by age groups : under 30 there were 5 smokers out of 13 patients (38.4% ), under 60 there were 6 smokers out of 43 patients (13.95% ), patients (8) over 60 years no one was a smoker.

Table V

AGE GROUP S	Screw		Cylinder		Total	Lost	
< 29	3	2	0	8	13	0	1
30 – 59	4	5	22	12	43	2	1
60 >	2	0	4	3	8	1	0
Total	9	7	26	23	65	3	2
	Female	Male	Female	Male		Female	Male

The PFM crowns were either screw retained or cemented. Smokers had one screw retained crown and ten cemented crowns. Non-Smokers had nine screw retained crowns and 45 cemented crowns.

## Discussion

There were no dropouts of patients during the follow up stages. An implant failure is defined as the removal of an implant. One (1) implant 1.54% was lost before the crown was performed. Reason for removal was the wrong position of the implant. Four (4) implants were lost after the crowns were performed.

The reason for the failures of these implants were reported infections caused by chronic mucositis with deep gingival pockets, which could not be cured in spite of chemotherapy and surgical procedures. The data of the failures is listed in table VI.



Table VI

FAILURES												
Implant placed	Failure	Arch	Sex	Age	Smoke	Type	Abutment		Screw/Cement	Surviving Time	Cause	
						diam	length mm					
1999	2000	Max /13	female	30 - 50	ns	3,5	13	cylinder	0		0-1	Position
1999	2001	Max /21	male	>30	smoker	3	16	cylinder	N-ANA 15	cemented	3 years	Infection
2000	2003	Mand/45	female	30-50	smoker	4	8	cylinder	B-ANA 15	cemented	3 years	Infection
1998	2004	Max /14	female	>60	ns	3,3	13	cylinder	B-ANA 20	cemented	6 years	Infection
1997	2005	Max /11	male	<30	ns	4	13	cylinder	B-ANA 15	cemented	8 years	Infection

Both female(20%) and male(16.67%) smokers lost more implants than non-smoking females(7.69%) or males(3.57%).Smokers(18.18%) in general lost more than three times more implants than non-smokers(5.56%)See Table II

In a study by P.M. Lambert, H.F. Morris and S. Ochi(ref.1) smokers experienced an implant failure rate almost 1.5 times the failure rate of patients who never smoked. N.E. McDermott, S-K Chuang, V.V. Woo and T.B. Dodson(ref.2) reported that tobacco use was associated with inflammatory complications in implants ( hazard ratio 2.62 and P value .002 : 95% 1.41-4.84 ).The higher % of failures in my study may be due to the smaller amount of implants and the specificity of prosthetics(only single crowns).

Anatomical variety was interesting because there was only one (1) failure (7,69%) in mandible and that was in the group of smokers. For non-smoker no implants were lost in mandible respectively in maxilla non-smokers had 6.82% failures and smokers 12.5%. See Table III. In a study S.K. Chuang, L.J. Wei, C.W. Douglass, and T.B. Dodson(ref.3) reported maxilla as a variable connected to implant failure.

Patients health status did not have any effect in failures with smokers or non-smokers. All the failures in smokers and non smoker were classified to ASA1.

The limited number of patients made it impossible to compare smokers and non-smokers. In the amount of 63 patients the age of the patients did not make a risk factor to fail an implant. Table V.

In this study immediate implantation or the use of Dentoalveolar Reconstruction Procedures were not significant risk factors for implant failures for non-smokers or smokers.



Immediate implantation with non-smokers had survival rate of 84,62% 11 of 13 implants survived and with smokers all 5 immediate implantations survived.

In augmentations done before implantation only one implant was lost during the time of study, that gives the survival rate of 85,71%.

Sinus lift was performed to four (4) patients, two (2) patients had a membrane placed over the augmentation. All lifts survived.

V.V. Woo, S-K Chuang, S. Daher, A. Muftu and T.B Dodson (ref. 4) report in their study that DRPs are not an independent risk factor for implant failure.

Table VII

	Surviving		Failures	
	Non-Smokers	Smokers	Non-Smokers	Smokers
Immediate Implantation	11	5	2	0
Augmentation before Implantation	7	1	1	0
Sinus Lift	4	0	0	0
Membrane	3	0	0	0

After the replacement of the crowns non-smokers lost two (2) cemented crowns (8,85%) and smokers lost two (2) cemented crowns (20%) none of the screw retained crowns were lost. Table VII

## Conclusion

Endosseous implant-base crowns are successful and predictable devices for replacing missing teeth. The purposes of this study was to identify smoking as a risk factor associated with implant failure. In this study and in all the reference studies it is clearly shown that smoking is a scientific risk factor for implant failure. These studies urge doctors, who are planing an implantation for a smoker to warn the patient of the risks involving tobacco use .

The survival results of Hi-Tec implants did not differ from the results of other implant systems in similar studies. The survival results being in 1-year 98.5% (one implant failed in the first year) and 5-year 95.4% (three implants failed in five years) in comparison with the study of V. A. Vehemente et al.(ref.5), who reported an estimate using the Kaplan-Meier analysis an overall survival of Biocon implants 1-year 95.2% and 5-year 90.2% respectively.

The findings in Table VI that all lost fixtures were cylinder shaped and non of the self thread fixtures failed and that all crowns lost were cemented and no screw retained crown failed are not reliable, because of the limited number of implants in the study. In the literature search these subjects were not studied and are questions for new study.

## Acknowledgements

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