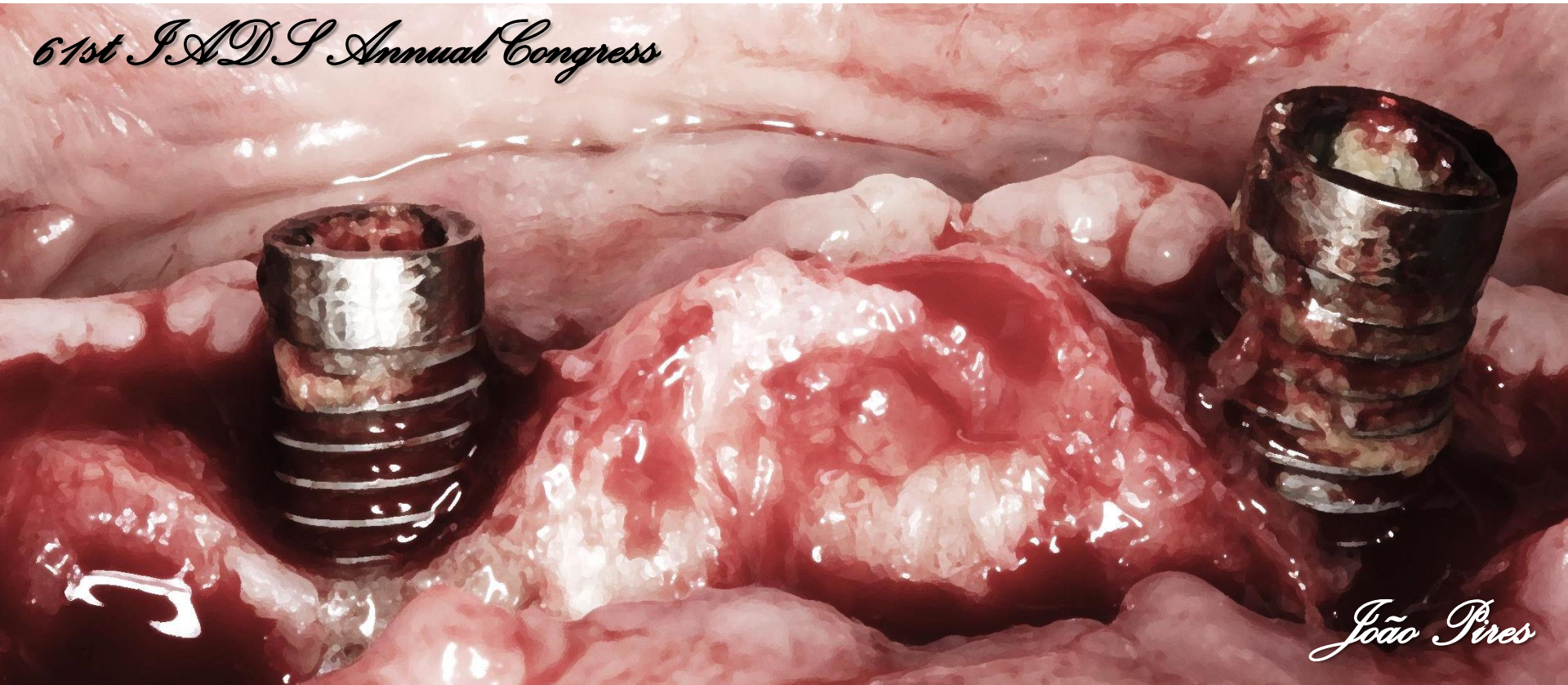
Area of Dentistry
Faculty of Medicine, University of Coimbra

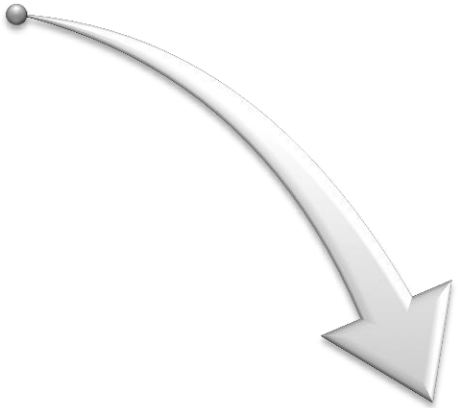
Antimicrobial efficacy of locally delivered minocycline in decontaminating implants affected by peri-implantitis: pilot study



Peri-implantitis

Inflammatory lesion of bacterial aetiology affecting soft and hard tissues around an osseointegrated implant in function with loss of supporting bone.

Albrektsson *et al.* 1994



THERE IS NO CONSENSUS

Definition of Peri-implantitis

The term is used improperly by clinicians to describe any peri-implant bone loss, discarding the numerous factors that may contribute to this problem.

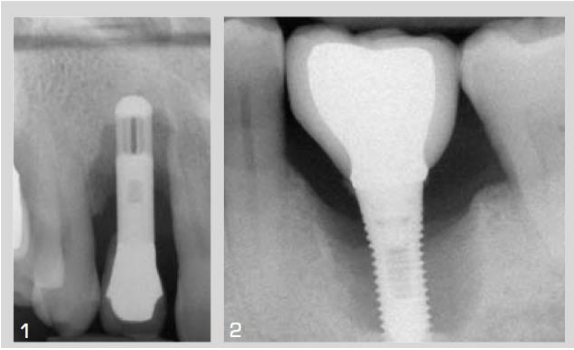
Pesce *et al.* 2014

Prevalence

1998

Mombelli & Lang 1998

- Rare phenomenon
- Prevalence 5% to 10%



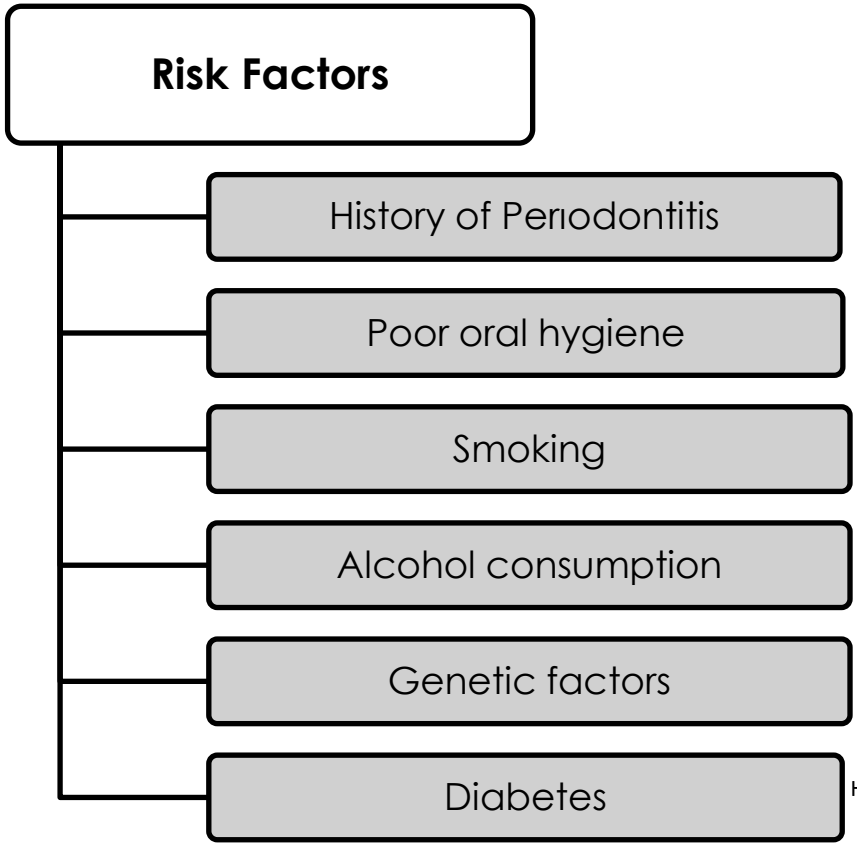
Peri-implantitis on superior-anterior (1) and inferior-posterior region (2).

2012

Mombelli *et al.* 2012

- 20% of pacients are affected
- 10% of implants are affected during 5-10 years after implant placement

Etiology



6th European Workshop on Periodontology

Heitz-Mayfiield *et al.* 2008; Lindhe *et al.* 2008; Algraffee *et al*. 2011

Etiology

PRIMARY ETIOLOGIC FACTOR

The establishment of **Bacterial Biofilms** on the implant surface

Heitz-Mayfield *et al.* 2010

- Mixed
- Variable
- Gram-negative anaerobic bacteria

Mombelli & Decaillet 2011

The removal of biofilm from the implant surface is a priority!

Treatment

Non-surgical

- **Mechanical** therapy:
  - Curettes
  - Ultrasonic
  - Air-abrasives
  - Laser
- **Chemical** therapy:
  - Antiseptics
  - Antibiotic (local or systemic)

Surgical

- **Resective** therapy:
  - Apically repositioned flap
  - Implantoplasty
- **Regenerative** therapy:
  - GBR technique

Treatment

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Surgical

- **Resective** therapy:
  - Apically repositioned flap
  - Implantoplasty
- **Regenerative** therapy:
  - GBR technique

Non-surgical therapy **alone** is **not effective** in the treatment of peri-implantitis

Renvert et al. 2008; Lindhe et al. 2008; Charalampakis et al. 2012; Esposito et al 2012

Decontamination methods

Mechanical Methods:

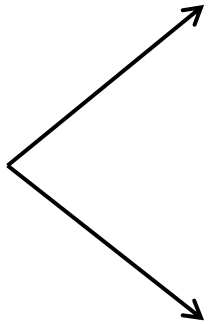
- Implantoplasty
- Air-abrasive
- Ultrasonic
- Curettes

Lasers:

- Er:YAG
- CO_2
- Photodinamic therapy

Chemical Methods:

- Chlorhexidine
- Tetracycline
- EDTA
- Saline
- Minocycline
- Citric acid



Chlorhexidine

- Wide spectrum
- Prevent plaque accumulation on titanium surfaces

Lang et al. 1997

Minocycline (microspheres)

- Gram-negative and gram-positive bacteria
- **Reduction** in **PPD** and **BOP** sites

Muthukuru *et al.* 2012

Antibiotic use: ⇨ Lack of **scientific evidency**!

van Winkelhoff *et al.* 2012

No *Gold Standard* treatment

No decontamination method that is **superior!**

Algraffee *et al.* 2012

Objetive

Evaluate the bacterial load present on contaminated implant surfaces after chemical decontamination with a combined solution of chlorhexidine and minocycline.

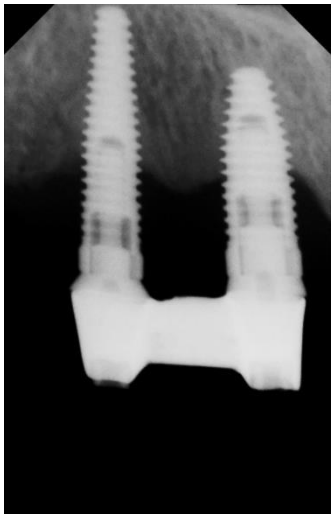
Patient selection

Subject	A	B	C
Age (years)	69	43	63
Race	Caucasian	Caucasian	Caucasian
Gender	♀	♂	♀
Smoking habit	No	6 cig./day	No
History of Periodontitis	Yes	No	Yes
Total implants	6	2	10
Type of rehabilitation	Removable	Fixed	Fixed
Implants model	Nobel Replace	Nobel Replace	Nobel Replace
Implants selected	3	1	1

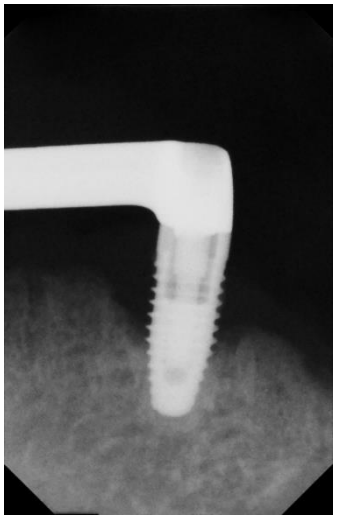
Patient selection

	Subject A			Subject B	Subject C
Implant	**A1**	**A2**	**A3**	**B1**	**C1**
Site	13	14	33	14	25
Deepest PD (mm)	6	6	6	9	10
BOP	+	+	+	+	+
SUP	-	-	-	-	-
Time of implant load (year)	8	8	9	7	7
Mobility	-	-	-	-	-
Implant surface	TiUnite®	TiUnite®	TiUnite®	TiUnite®	TiUnite®

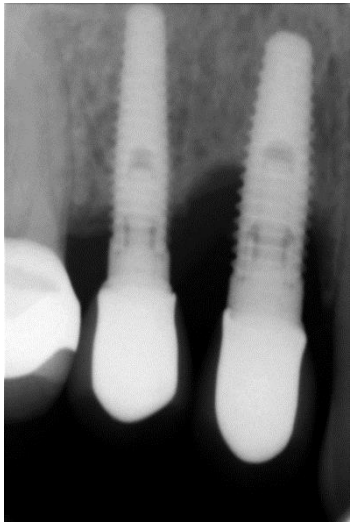
Seleção dos pacientes



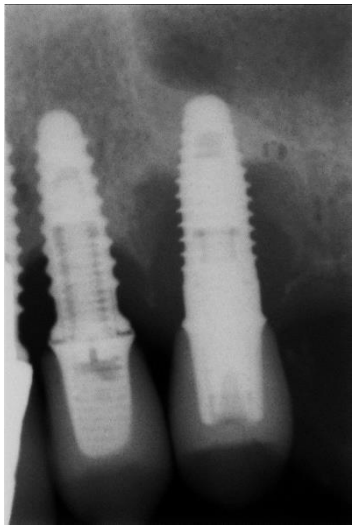
Periapical radiographs of implants **A1** and **A2**.



Periapical radiograph of implant **A3**.

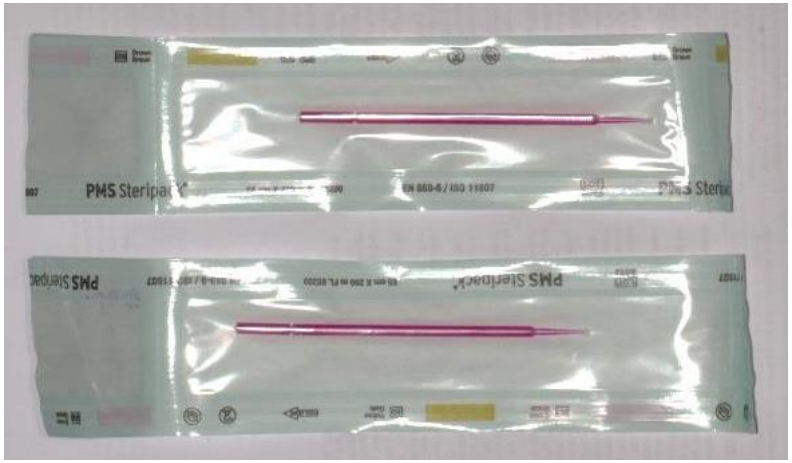


Periapical radiograph of implant **B1**.



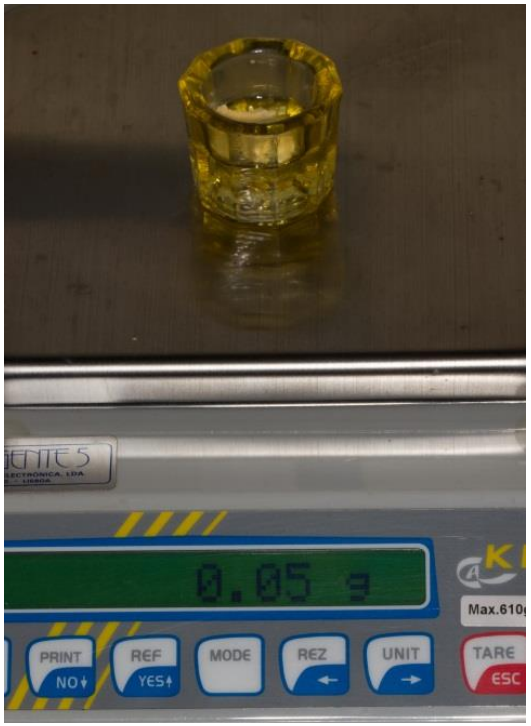
Periapical radiograph of implant **C1**.

Microbrushes sterelization

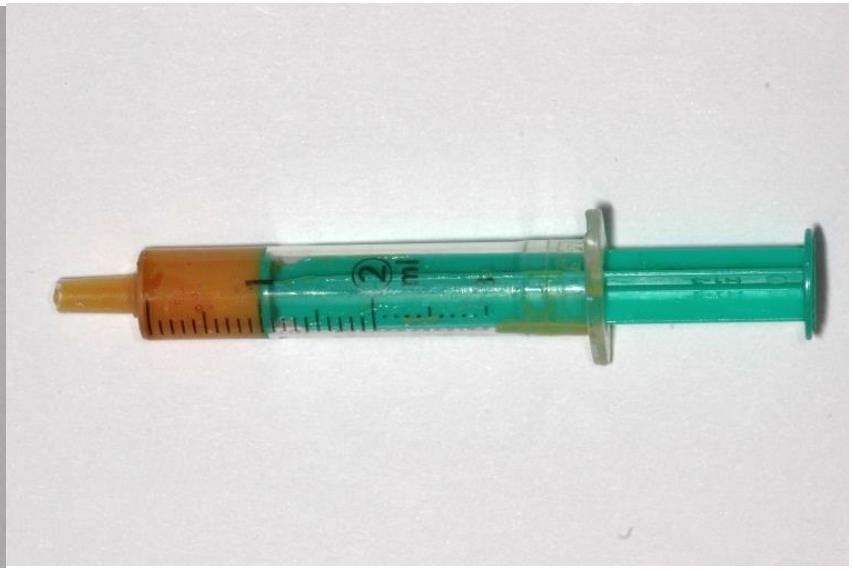


Solution preparation

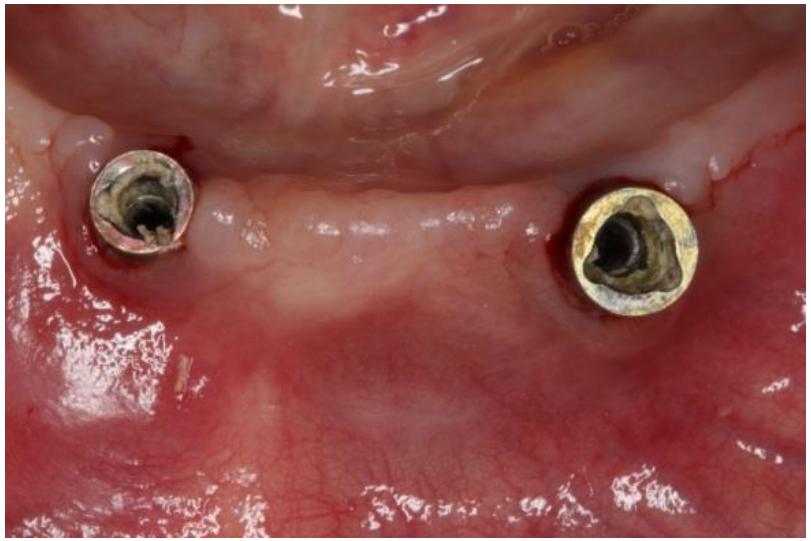
Solution preparation



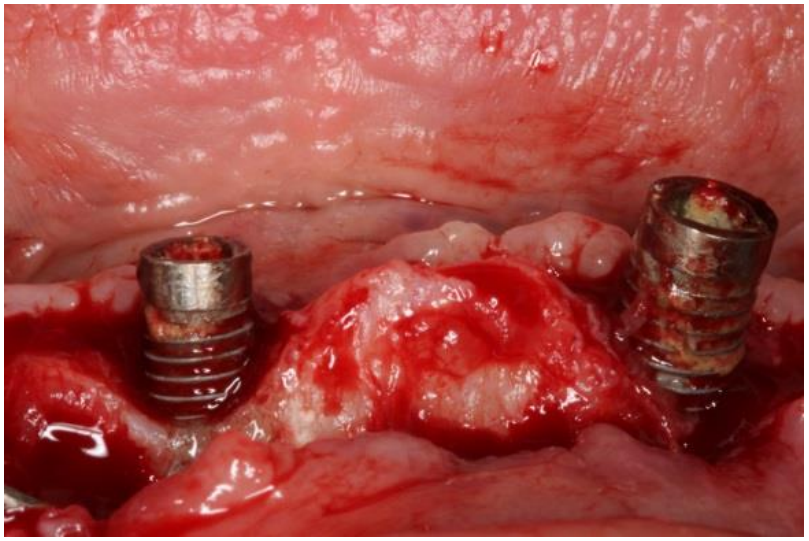
Solution preparation

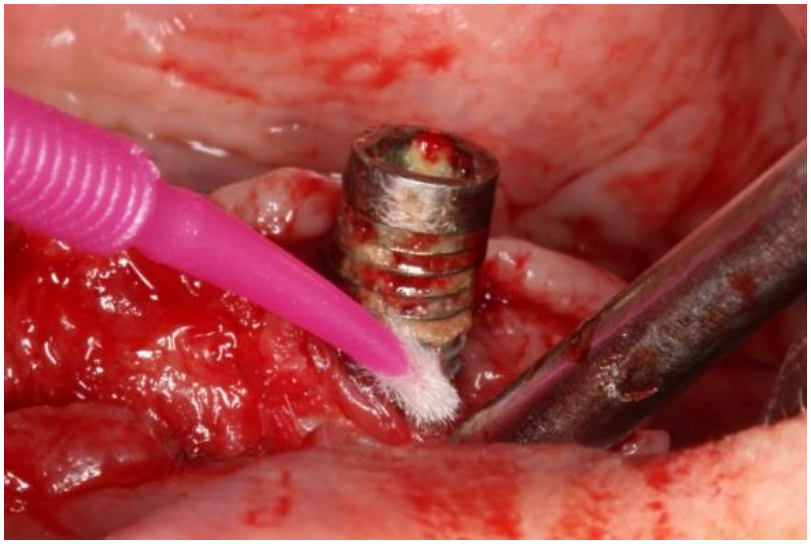


Surgical procedure

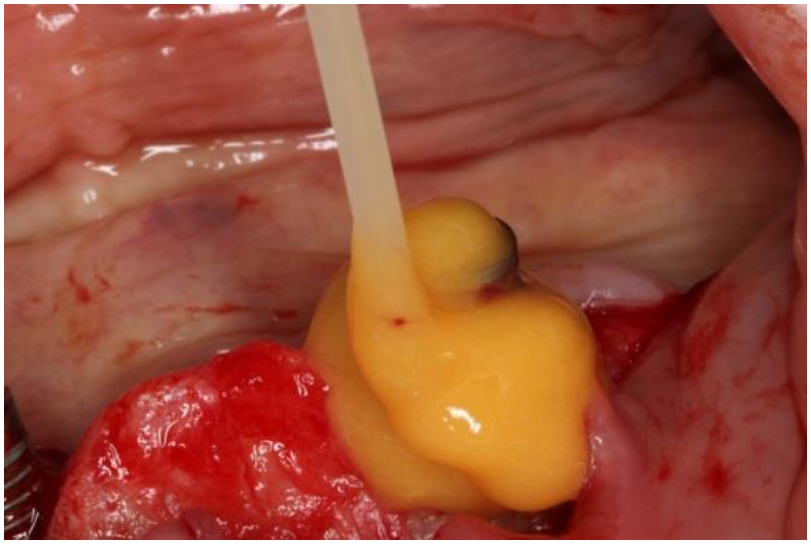


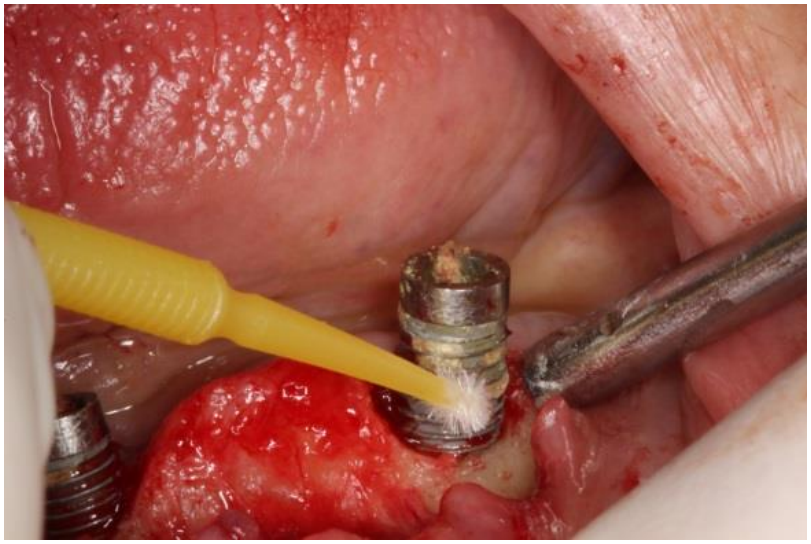
Microbiological sample collection





Surface decontamination





Real-time PCR

Absolute quantification of DNA (µgADN/ml) ⇨

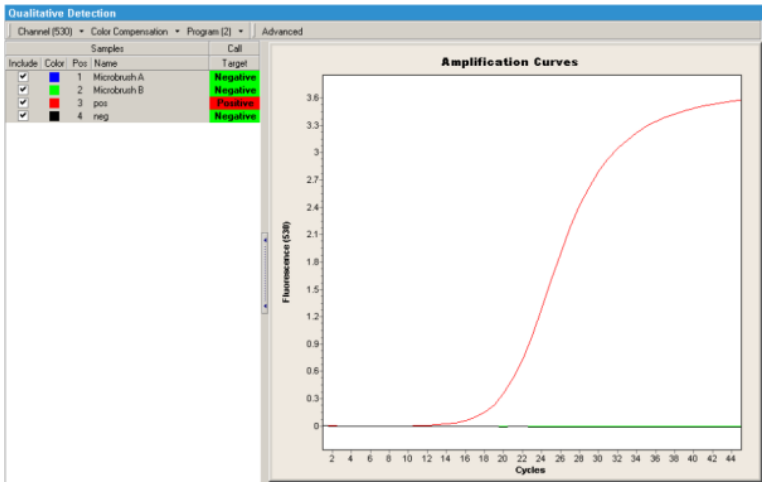
- Total bacteria
- *Streptococcus* spp

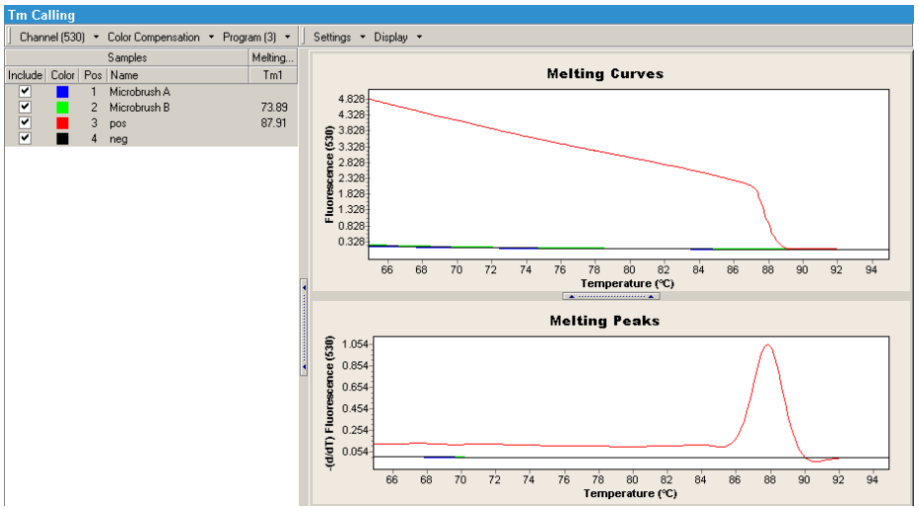
Qualitative detection of DNA (C_P) ⇨

- *Porphyromonas gingivalis* (*Pg*)
- *Prevotella intermedia* (*Pi*)
- *Fusobacterium* spp (*Fb*)
- *Aggregatibacter actinomycetemcomitans* (*Aa*)

LightCycler 2.0

Microbrushes sterelization





- Microbial analysis of total bacteria was negative for the sterile microbrushes.

Quantitative analysis (µgADN/ml)

	Total bacteria		***Streptococcus spp***	
Subject	Initial	Final	Initial	Final
A1	0,248	0,030	0,010	0,005
A2	3,405	0,028	0,012	0,004
A3	0,039	0,025	0,010	0,004
B1	6,495	0,448	0,530	0,035
C1	10,925	0,150	0,540	0,020
Mean	4,222	0,136	0,22	0,014
p-value	0.043		0.043	

Wilcoxon test; $p<0.05$

Qualitative analysis (C_P)

Subject	*Aggregatibacter actinomycetemcomitans*			*Fusobacterium spp*			*Prevotella intermedia*			*Porphyromonas gingivalis*		
	Initial	Final	Result	Initial	Final	Result	Initial	Final	Result	Initial	Final	Result
A1	ND	ND		30,07	30,90	Maintained	40	ND	Decreased	ND	ND	
A2	ND	ND		24,83	29,33	Decreased	ND	ND		ND	ND	
A3	ND	ND		33,15	32,91	Maintained	ND	ND		ND	ND	
B1	32,89	40	Decreased	20,71	24,19	Decreased	ND	ND		ND	ND	
C1	ND	ND		21,62	27,65	Decreased	ND	ND		32,74	34,59	Decreased

- *Fusobacterium spp* were detected in all five implant samples.
- *Fusobacterium spp* DNA was considered maintained in implants A1 and A3 from the same subject .

Qualitative analysis (C_P)

	Aggregatibacter actinomycetemcomitans			*Fusobacterium spp*			*Prevotella intermedia*			*Porphyromonas gingivalis*		
Subject	Initial	Final	Result	Initial	Final	Result	Initial	Final	Result	Initial	Final	Result
A1	ND	ND		30,07	30,90	Maintained	40	ND	Decreased	ND	ND	
A2	ND	ND		24,83	29,33	Decreased	ND	ND		ND	ND	
A3	ND	ND		33,15	32,91	Maintained	ND	ND		ND	ND	
B1	32,89	40	Decreased	20,71	24,19	Decreased	ND	ND		ND	ND	
C1	ND	ND		21,62	27,65	Decreased	ND	ND		32,74	34,59	Decreased

- *Porphyromonas gingivalis* DNA present in implant C1 and *Aggregatibacter actinomycetemcomitans* DNA present in implant B1 exhibited a relative decrease after implant surface decontamination

Qualitative analysis (C_P)

Subject	*Aggregatibacter actinomycetemcomitans*			*Fusobacterium spp*			*Prevotella intermedia*			*Porphyromonas gingivalis*		
	Initial	Final	Result	Initial	Final	Result	Initial	Final	Result	Initial	Final	Result
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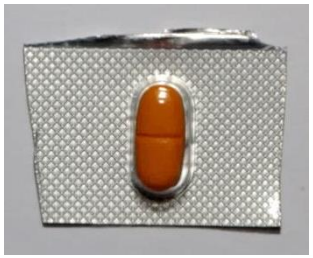
B1	32,89	40	Decreased	20,71	24,19	Decreased	ND	ND		ND	ND	
C1	ND	ND		21,62	27,65	Decreased	ND	ND		32,74	34,59	Decreased

- *Prevotella intermedia* DNA was initially present before surface decontamination in implant A1; however, in the second sample RT-PCR technique was unable to detect any DNA.

Discussion

- **Association of** Chlorhexidina + Minocycline
- **Type** of delivering method
- **Quantity/Volume** used

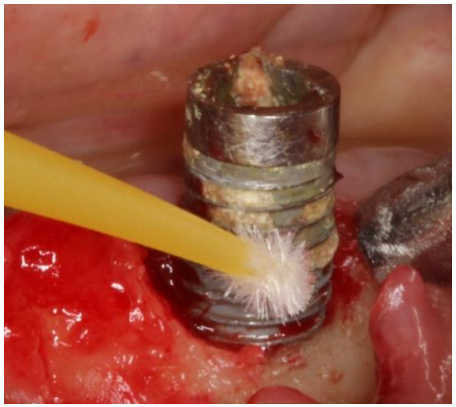


Sample method

The perfect microbiological sample method still **haven't been created**!

Endodontic **paper points** ???

van der Horst *et al.* 2013



Microbrushes seem to be an alternative microbiological sample method in implant surfaces.

- **New**
- Easy to use
- Wide and adaptable contact area

Conclusions

- The used protocol was efficient on reducing the **total bacteria** and ***Streptoccocus spp*** load after implant surface decontamination with a combined solution of 0.2% chlorhexidine and 50mg of minocycline.

- ***Pg***, ***Pi***, ***Aa*** and ***Fb*** seem to be susceptible to the anibiotic treatment.

- Bacterial sampling at implant surfaces with **sterile microbrushes** appears to be an effective method of collection.

Thank you!