PARTICIPAÇÃO DE ANAERÓBIOS NAS INFECÇÕES ORAIS

UNIVERSIDADE ESTADUAL PAULISTA
"JÚLIO DE MESQUITA FILHO"
Campus de Araçatuba

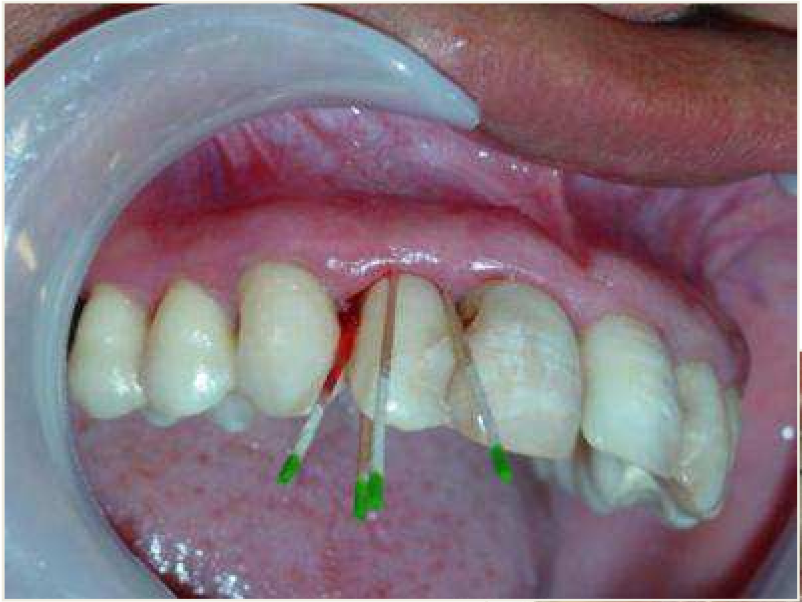
Elerson Gaetti Jardim Júnior FOA-UNESP

Sinais das infecções anaeróbias

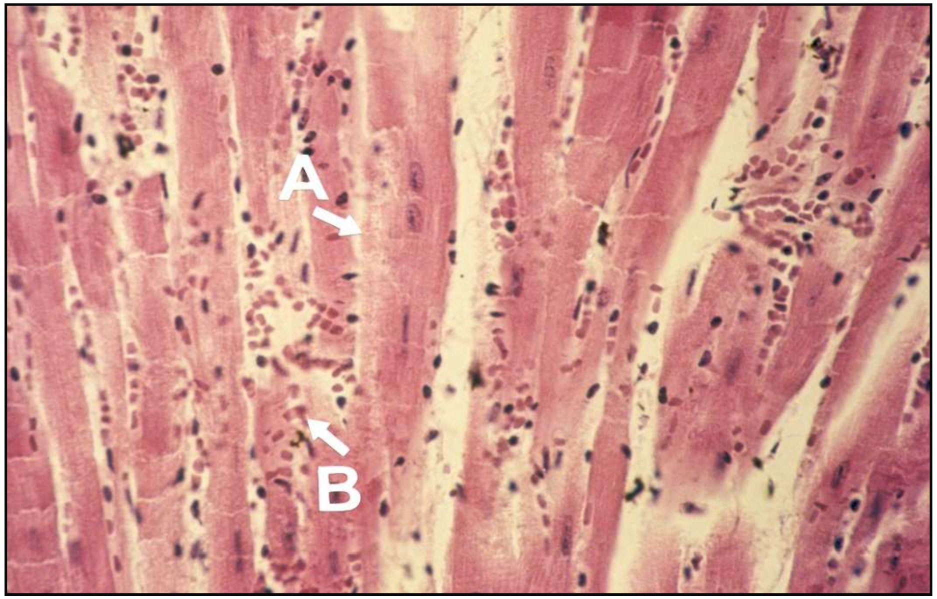
- Supuração, formação de abscessos, tromboflebite e destruição gangrenosa do tecido;
- Relação anat|ômica com mucosa;
- Odor pútrido e presença de gás;
- Bactermia ou endocardirte sem crescimento bacteriano no cultvo em aerobiose;
- Histórico de uso de antimicrobianos voltados para aeróbios;
- Infecções oportunistas ligados a tumores ou outros processos destrutivos
- Infecções pós-mordidas de animais e humanos;
- Formação de grânumos compactos e de coloração amarelada;
- Gangrena tecidual.

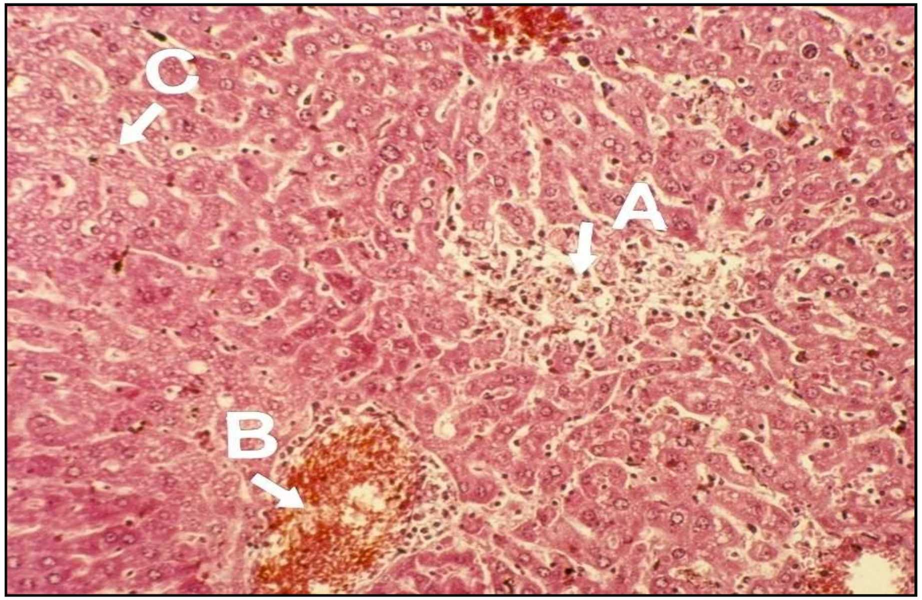
Brook, 2016

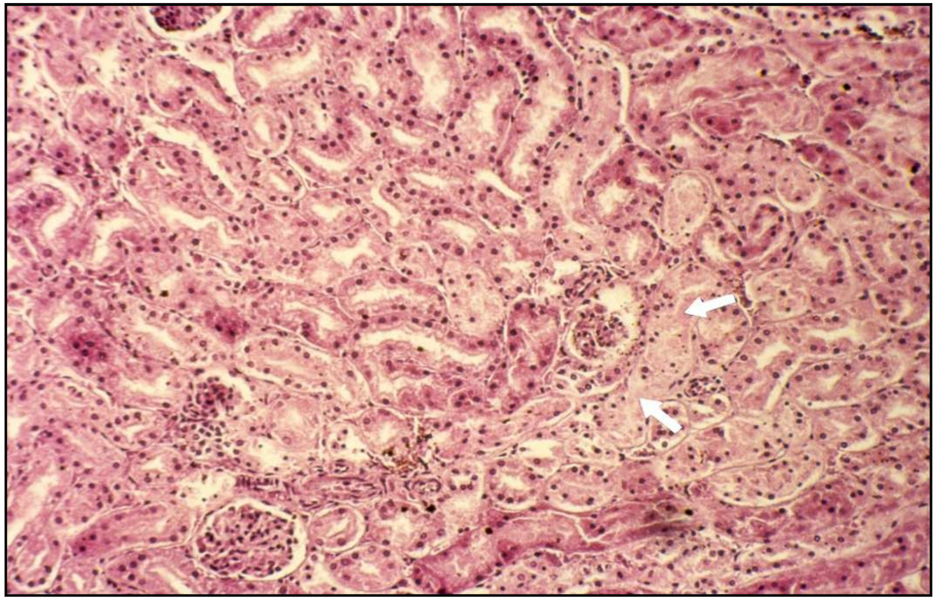
CTBMF FOA-
UNESP



Microbiota bucal: danos sistêmicos







Microrganismos bucais são o principal elo de ligação entre a medicina e a odontologia.

Quadro 1 – Infecções Sistêmicas Causadas por Microrganismos Bucais *

Infecções	Microrganismos
Endocardite infecciosa	Estreptococos bucais
	E. corrodens
	A. actinomycetemcomitans
	M. micros
Bacteremia	Estreptococos bucais
	P. gingivalis
	Enterobacteriaceae
	Cândida sp.
Sepse	*A. actinomycetemcomitans*
Abscesso cerebral	*A. actinomycetemcomitans*
Infecções respiratórias	*A. actinomycetemcomitans*
	Enterobacteriaceae
	Staphylococcus
Oftalmoplegia	*A. actinomycetemcomitans*
Infecções intra-abdominais	*P. gingivalis*
Otite média supurativa	*P. gingivalis*
Infecções vaginais	*M. micros*
Conjuntivite crônica	*M. micros*
Endoftalmite	*A. actinomycetemcomitans*
Abscesso do tubo ovariano	*P. gingivalis*

Morais et al., 2006

Table 2
Anaerobic bacteria most frequently encountered in specific infection sites.

Organism		Infection site
Gram-positive cocci	*Peptostreptococcus* spp.Microaerophilic streptococci (not obligate anaerobes)	Respiratory tract, intra-abdominal and soft-tissue infections Sinusitis, brain abscesses
Gram-positive bacilli	Nonspore-forming: *Actinomyces* spp.	Intracranial abscesses, chronic mastoiditis, aspiration pneumonia, head and neck infections
	Propionibacterium	Shunt infections (cardiac, intracranial), infections associated with foreign body
	Bifidobacterium spp.	Chronic otitis media, cervical lymphadenitis, abdominal infections
	Acnes	
	Spore-forming: *Clostridium perfringens*	Soft-tissue infection, sepsis, food poisoning
	Clostridium septicum	Sepsis, neutropenic enterocolitis
	Clostridium difficile	Colitis, antibiotic-associated diarrheal disease
	Clostridium botulinum	Botulism
	Clostridium tetani	Tetanus
	Clostridium ramosum	Soft-tissue infections
Gram-negative bacilli	*Bacteroides fragilis* group	Intra-abdominal and female genital tract infections, sepsis, neonatal infections
	Pigmented	Orofacial infections, aspiration pneumonia, periodontitis
	Prevotella and *Porphyromonas* spp.	Orofacial infections
	Prevotella oralis, Prevotella oris-buccae,	Orofacial infections, intra-abdominal infections
	Prevotella bivia, Prevotella disiens,	Female genital tract infections
	Fusobacterium nucleatum,	Orofacial and respiratory tract infections, brain abscesses, bacteremia
	Fusobacterium necrophorum	Aspiration pneumonia, mastoiditis, Lemiere's Syndrome, bacteremia

Table 3
Aerobic and anaerobic bacteria isolated in head and neck and upper respiratory tract infections.

Type of infection	Aerobic and facultative organisms	Anaerobic organism
Otitis media and mastoiditis: acute	*Streptococcus pneumonia*	*Peptostreptococcus* spp.,
Chronic	*Haemophilus influenzae*[a]	Pigmented *Prevotella* and *Porphyromonas* spp.[a]
	Moraxella catarrhalis[a]	*Bacteroides* spp.[a]
	Staphylococcus aureus[a]	*Fusobacterium* spp.[a]
	Escherichia coli[a]	*Peptostreptococcus* spp.
	Klebsiella pneumoniae[a]	
	Pseudomonas aeruginosa[a]	
Peritonsillar and retropharyngeal abscess	*Streptococcus pyogenes*	*Fusobacterium* spp.[a]
	Staphylococcus aureus[a]	Pigmented *Prevotella* and *Porphyromonas* spp.[a]
Recurrent tonsillitis	*Streptococcus pyogenes*	*Fusobacterium* spp.[a]
	Haemophilus influenzae[a]	
	Staphylococcus aureus[a]	
Suppurative thyroiditis	Streptococcus pyogenes	Pigmented *Prevotella* and *Porphyromonas* spp.[a]
	Staphylococcus aureus[a]	*Peptostreptococcus* spp.
Sinusitis: acute chronic	*Haemophilus influenzae*[a]	*Peptostreptococcus* spp.
	Streptococcus pneumoniae	Pigmented *Prevotella* and *Porphyromonas* spp.[a]
	Moraxella catarrhalis[a]	*Fusobacterium* spp.[a]
	Staphylococcus aureus[a]	*Bacteroides fragilis* group[a]
	Streptococcus pneumonia	
	Haemophilus influenzae[a]	
Cervical lymphadenitis	*Staphylococcus aureus*[a]	Pigmented *Prevotella* and *Porphyromonas* spp.[a]
	Mycobacterium spp.	*Peptostreptococcus* spp.
Postoperative infection disrupting oral mucosa	*Staphylococcus* spp.[a]	*Fusobacterium* spp.[a]
	Enterobacteriaceae[a]	*Bacteroides* spp.[a]
	Streptococcus pyogenes	Pigmented *Prevotella* and *Porphyromonas* spp.[a]
		Peptostreptococcus spp.
Deep neck abscesses and parotitis	*Streptococcus* spp.	*Bacteroides* spp.[a]
	Staphylococcus spp.[a]	*Fusobacterium* spp.[a]
		Peptostreptococcus spp.[a]
Odontogenic complications	*Streptococcus* spp.	Pigmented *Prevotella* and *Porphyromonas* spp.[a]
	Staphylococcus spp.[a]	*Peptostreptococcus* spp.
Oropharyngeal: Vincent's angina and necrotizing	*Streptococcus* spp.	*Fusobacterium necrophorum*[a]
	Staphylococcus spp.[a]	

[a] Organisms that have the potential of producing β-lactamase.

Table 6
Antimicrobial drugs recommended for the therapy[a] of site-specific anaerobic infections.

	Parenteral	Oral
Intracranial	1. Metronidazole[c] 2. Chloramphenicol	1. Metronidazole[c] 2. Chloramphenicol
Dental	1. Clindamycin 2. Metronidazole[c], Ticarcillin + CA, Ampicillin + SU[e],	1. Clindamycin, Amoxicillin + CA 2. Metronidazole[c]
Upper respiratory tract	1. Clindamycin 2. Ticarcillin + CA, Ampicillin + SU[e], 3. metronidazole[c]	1. Clindamycin, Amoxicillin + CA 2. Metronidazole[d]
Pulmonary	1. Clindamycin[d] 2. Ticarcillin + CA, Ampicillin + SU[e], imipenem or meropenem	1. Clindamycin[f] 2. Metronidazole[d], Amoxicillin + CA
Abdominal	1. Metronidazole[b] 2. Imipenem or meropenem ertapenem, piperacillin-tazobactam, tigecycline, cefoxitin[b]	1. Metronidazole[f] 2. Amoxicillin + CA
Pelvic	1. Cefoxitin[e], clindamycin[b] 2. Piperacillin–tazobactam[e], ampicillin + SU[e], metronidazole[e]	1. Clindamycin[e] 2. Amoxicillin + CA[e], metronidazole[e]
Skin and soft tissue	1. Clindamycin, cefoxitin 2. Metronidazole + vancomycin 3. Tigecycline	1. Clindamycin, amoxicillin + CA 2. Metronidazole + linezolid
Bone and joint	1. Clindamycin, imipenem or meropenem 2. Metronidazole + vancomycin, piperacillin–tazobactam	1. Clindamycin 2. Metronidazole + linezolid
Bacteremia with BLPB	1. Imipenem or meropenem, metronidazole 2. Cefoxitin, ticarcillin + CA	1. Clindamycin, metronidazole 2. Chloramphenicol, amoxicillin + CA
Bacteremia with non-BLPB	1. Penicillin 2. Clindamycin, metronidazole, cefoxitin	1. Penicillin 2. Metronidazole, chloramphenicol, clindamycin

1, Drug(s) of choice; 2, Alternative drugs; In location proximal to the rectal and oral areas use cefoxitin.

[a] Therapies are given as drug(s) of choice (alternative drugs). BLPB, β-lactamase-producing bacteria; CA, clavulanic acid; NA, not applicable; SU, sulbactam.

[b] Plus aminoglycoside.

[c] Plus a penicillin.

[d] Plus a macrolide (i.e. erythromycin).

[e] Plus doxycycline.

[f] Plus a quinolone (only in adults).

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BRITISH Journal of Oral and Maxillofacial Surgery

www.bjoms.com

Microbiology of odontogenic infections in deep neck spaces: A retrospective study

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Accepted 11 December 2008

Table 1
Organisms identified.

Organisms identified	Number (%) of cases ($n = 75$)
Streptococcus milleri	14 (19)
Mixed anaerobes	7 (9)
Both *Streptococcus milleri* and mixed anaerobes	5 (7)
Actinomyces spp.	1 (1)
S. aureus	2 (3)
Escherichia coli	1 (1)
Normal oral flora	18 (24)
No significant growth	27 (36)

Microbiota aeróbia ou facultativa isolada de infecções odontogênicas

Microrganismo	Isolados (200)
estreptococos viridans	139
Staphylococcus spp.	9
Corynebacterium spp.	9
Campylobacter spp.	9
Neisseria spp.	8
Actinomyces spp.	7
Lactobacillus spp.	6
Enterobacter spp.	3
Haemophilus spp.	3
outros	7

Microbiota anaeróbia obrigatória isolada de infecções odontogênicas

Microrganismo	Isolados (464)
Peptosreptococcus spp.	105
Prevotella spp.	149
Fusobacterium spp.	90
Gemella spp.	36
Porphyromonas spp.	35
Bacteroides spp.	14
Eubacterium spp.	9
Veillonella spp.	8
Propionibacterium spp.	2
outros	16

Table 2. PREDOMINANT BACTERIAL ISOLATES IN 16 CHILDREN WITH PERITONSILLAR ABSCESSES

Aerobic and Facultative Isolates	No. of Isolates	Anaerobic Isolates	No. of Isolates
Gram-positive cocci (total)	27	**Anaerobic cocci (total)**	22
Group A beta-hemolytic streptococci	4	**Gram-positive bacilli (total)**	12
		Clostridium spp.	3
S. aureus	3		
Gram-negative bacilli (total)	5	**Gram-negative bacilli (total)**	57
H. influenzae	4	*Fusobacterium* spp.	15
		Bacteroides spp.	14
		pigmented *Prevotella* and *Porphyromonas* spp.	23
		Prevotella oralis	5
Total no. of aerobes	32	**Total no. of anaerobes**	91

NOTE. Boldface indicates total groups of bacteria.
Data from Brook.[4]

Itzhak Brook. Oropharyngeal Abscesses. J Oral Maxillofac Surg 2004.

Table 3. PREDOMINANT BACTERIAL ISOLATES IN 14 CHILDREN WITH RETROPHARYNGEAL ABSCESSES

Aerobic and Facultative Isolates	No. of Isolates	Anaerobic Isolates	No. of Isolates
Gram-positive cocci (total)	22	**Anaerobic cocci (total)**	25
Group A beta-hemolytic streptococci	3	*Peptostreptococcus* spp	18
		Gram-positive bacilli (total)	7
S aureus	5	Gram-negative bacilli	
Gram-negative bacilli (total)	4	*Fusobacterium* spp	14
H influenzae type B	3	*Bacteroides* spp	11
		pigmented *Prevotella* and *Porphyromonas* spp	18
		Prevotella oralis	3
Total no. of aerobes	26	**Total no. of anaerobes**	78

NOTE. Boldface indicates total groups of bacteria.
Data from Brook.[5]

Itzhak Brook. Oropharyngeal Abscesses. J Oral Maxillofac Surg 2004.

Table 4. MICROBIOLOGIC DATA (N = 24)

	No. of Strains	% of Cases	% of Strains Penicillin Resistant*
No growth (2 cases)	None	8	
Aerobes			
S. milleri group species	12	50	0
Other *S. viridans* species (excluding *S. milleri*)	2	8	0
Other streptococci	3	13	33
Other aerobic/facultative species	12	50	58
Anaerobes			
Prevotella and *Porphyromonas* species	23	63	35
F. nucleatum	5	21	25
Peptostreptococcus species	12	50	0
Other anaerobic species	21	88	0

*Not all strains were tested for antibiotic sensitivity.

Flynn, Shanti, and Hayes. Severe Odontogenic Infections. J Ora Maxillofac Surg 2006.

Dados sugestivos da participação de microrganismos anaeróbios

Table 5. SUMMARY MICROBIOLOGIC DATA (N = 24)

Culture and Sensitivity Results	No. of Cases	% of Cases
No growth	2	8
Oxygen requirements		
Aerobes only	2	8
Anaerobes only	4	17
Mixed aerobes and anaerobes	16	67
Antibiotic resistance		
Penicillin	13	54
Clindamycin	4	17

Microrganismos mais freqüentemente associados às infecções de cabeça e pescoço em primatas humanos

- "estreptococos do grupo *viridans*"
- *Parvimonas* sp. e *Peptostreptococcus* sp.
- *Prevotella* spp. e *Porphyromonas* spp.
- *Fusobacterium* spp. e *Bacteroides* spp.
- *Treponema* sp. *Campylobacter* sp.

Pallasch, 1993
Socransky & Haffajee, 2002
Kuboniwa et al., 2006
Brook, 2016

Outros microrganismos mais frequentemente associados às infecções de cabeça e pescoço em primatas humanos

- ✓ *Enterococcus* spp. e *Enterobacteriaceae*
- ✓ *S. aureus* e *S. epidermidis*
- ✓ *Actinomyces* spp. e *Lactobacillus* spp.
- ✓ *Eubacterium* spp. e *Eikenella corrodens*
- ✓ *Pseudomonas* spp.
- ✓ *Propionibacterium* spp. e *Corynebacterium* spp.

Pallasch, 1993

Socransky & Haffajee, 2002

Kuboniwa et al., 2006

Brook, 2016

⇨**Nome: SOS**

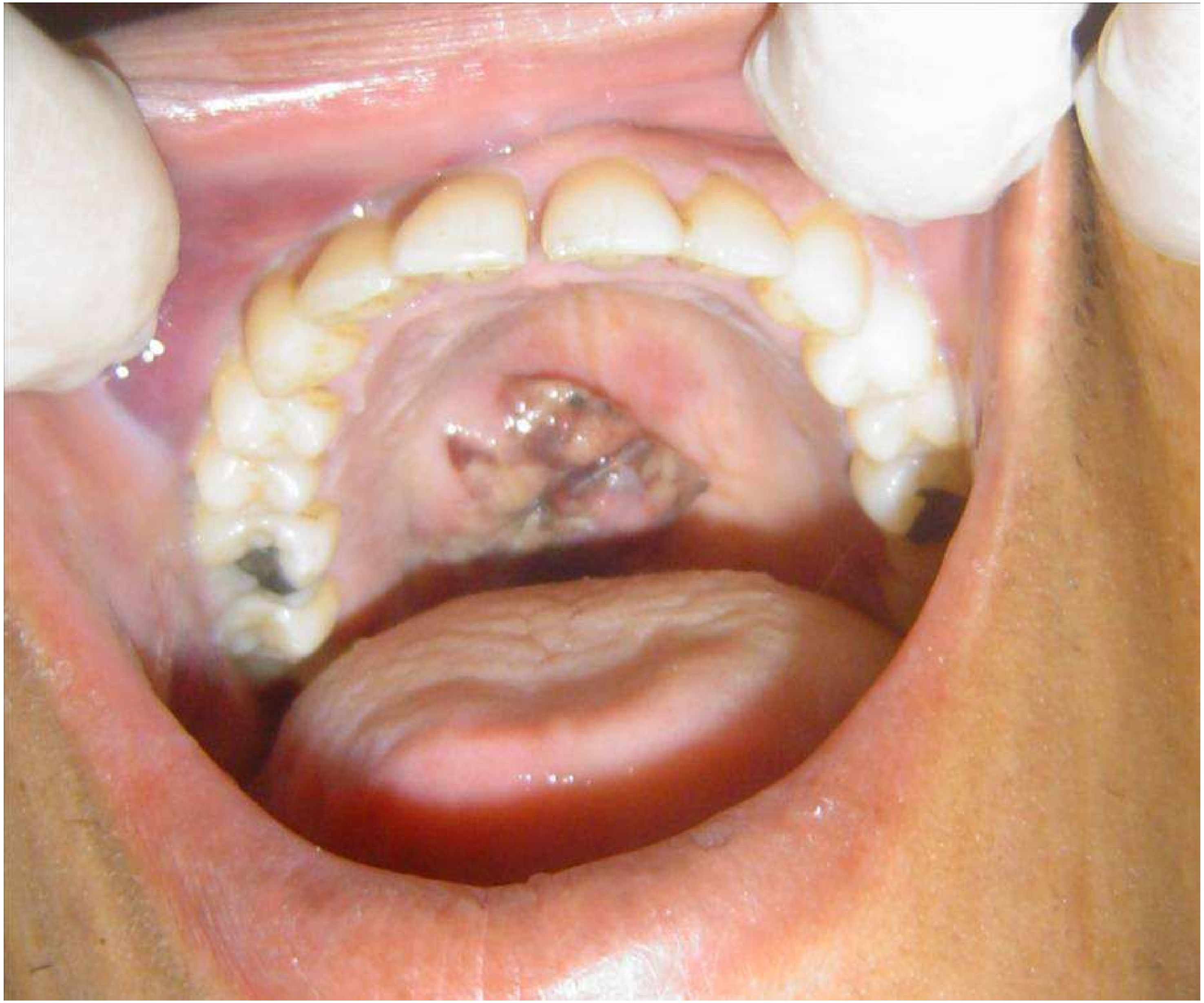
Idade: 36a

⇨ **Local do atendimento: STA CASA ATA**

⇨ **História da doença atual: Trauma em face**

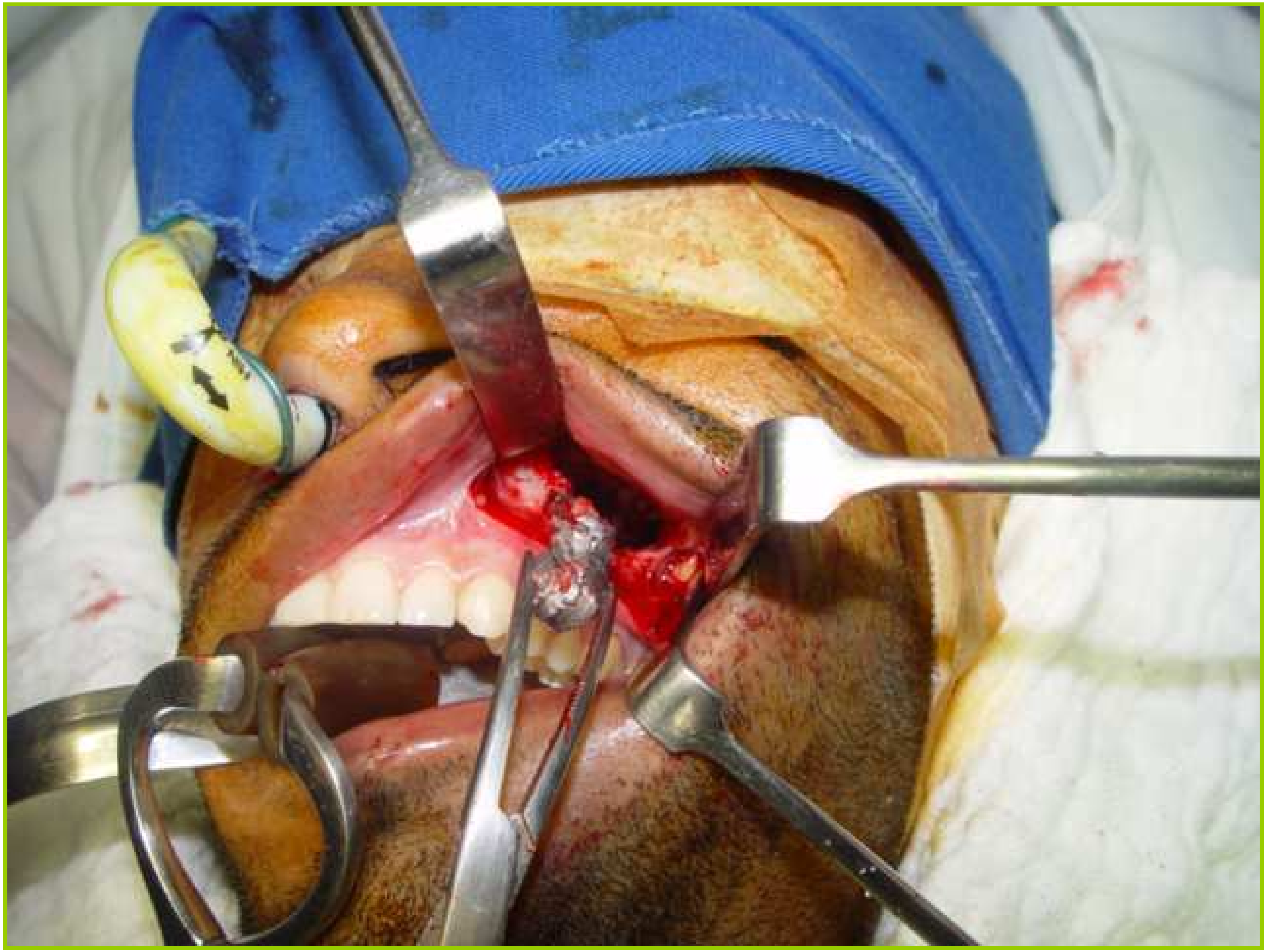
⇨ **Diagnóstico: FAF em 04/01/2010**

⇨**Microbiota: infecção maxilar envolvendo microrganismos típicos do biofilme dental, em particular *P. gingivalis* e *P. micra***




Biofilme e os entorpecentes

- **Nome: HQS (21 anos).**
- **Local do atendimento: PS de Birigui**
- **História da doença atual: FAF.**
- **Diagnóstico: Fratura de CZM E e fratura de assoalho de órbita.**
- **Conduta: Avaliação clínica e radiográfica. Procedimento cirúrgico para remoção de projétil e redução de fratura de CZM E. Alta hospitalar sob orientações e prescrição. Retorno agendado para no ambulatório (nunca realizado).**
- **Microbiota: *S. aureus, F. nucleatum*.**




Casa de Misericordia de Araçatuba
pital Sagrado Coração de Jesus
HEBER Q. SANTOS

⇨ **Nome: PSS   Idade: 14a (diabetes)**

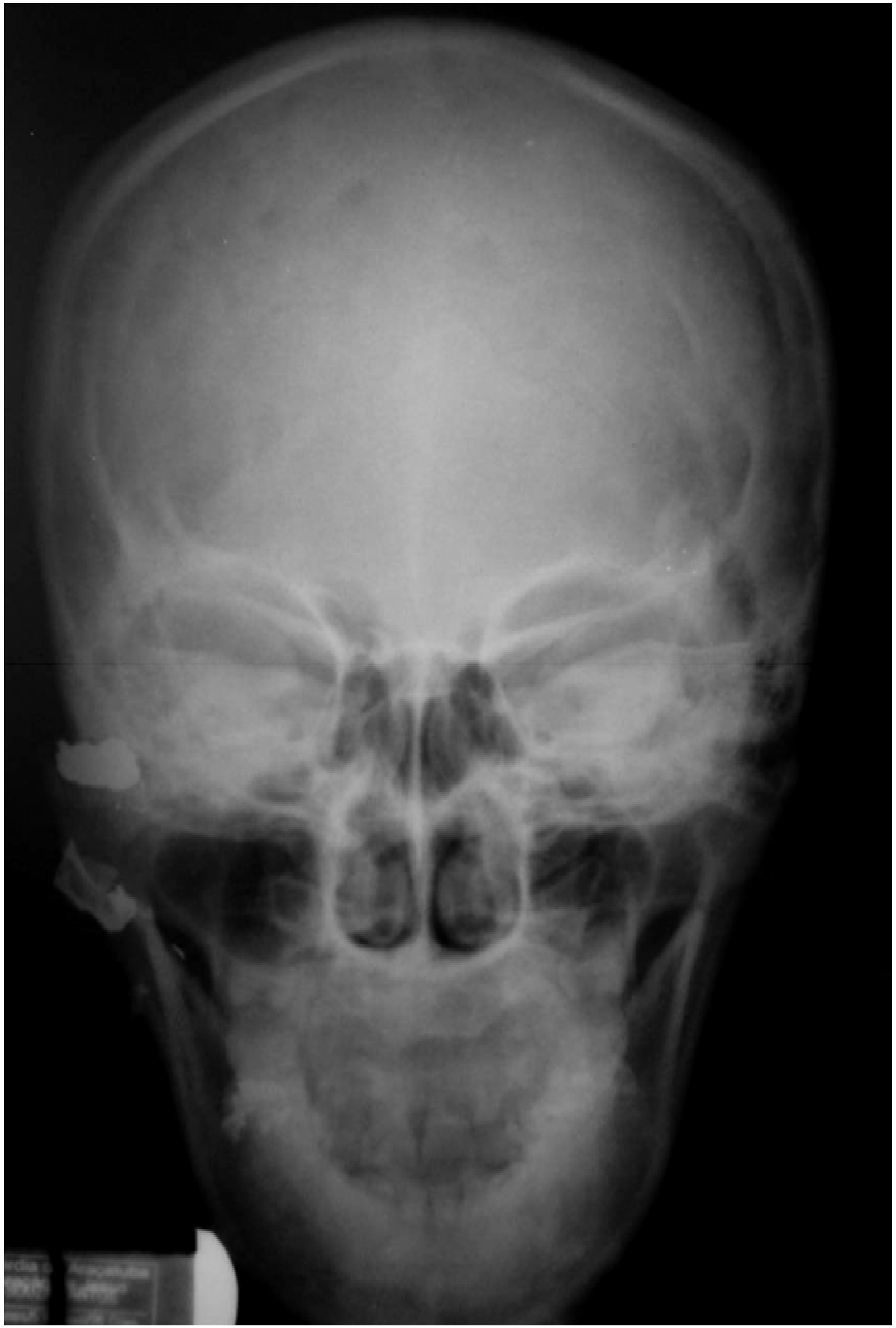
⇨ **Local do atendimento: P.S ATA**

⇨ **História da doença atual: Trauma em face**

⇨ **Diagnóstico: FAF e quadro septicêmico**

⇨**Conduta: antibioticoterapia e observação para remoção de fragmentos**

⇨**Microbiota: *S. aureus*, *F. necrophorum e F. nucleatum.***

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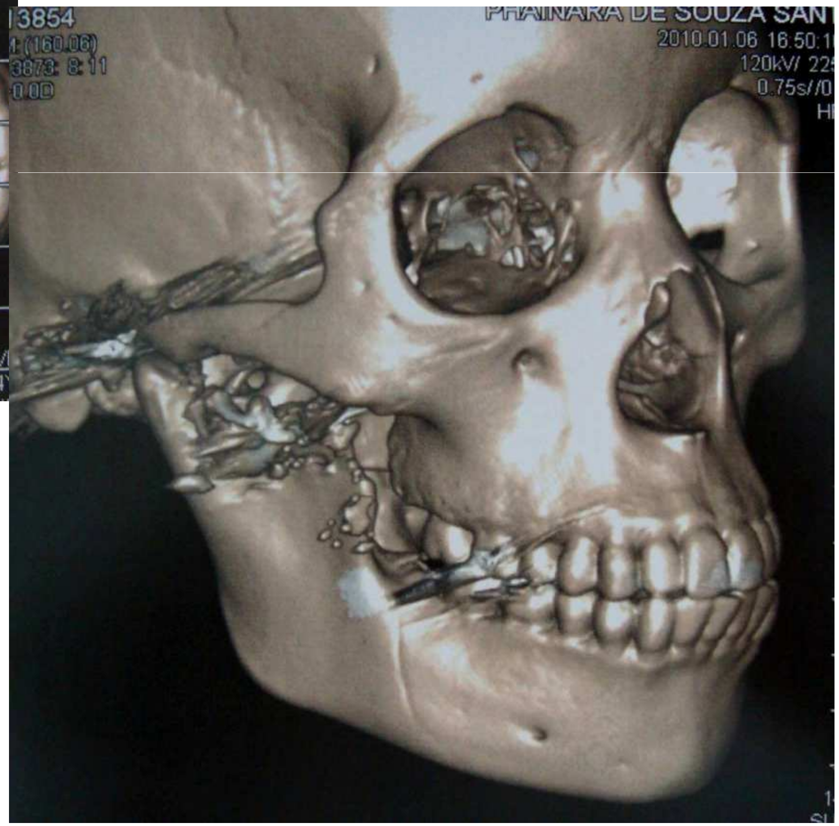
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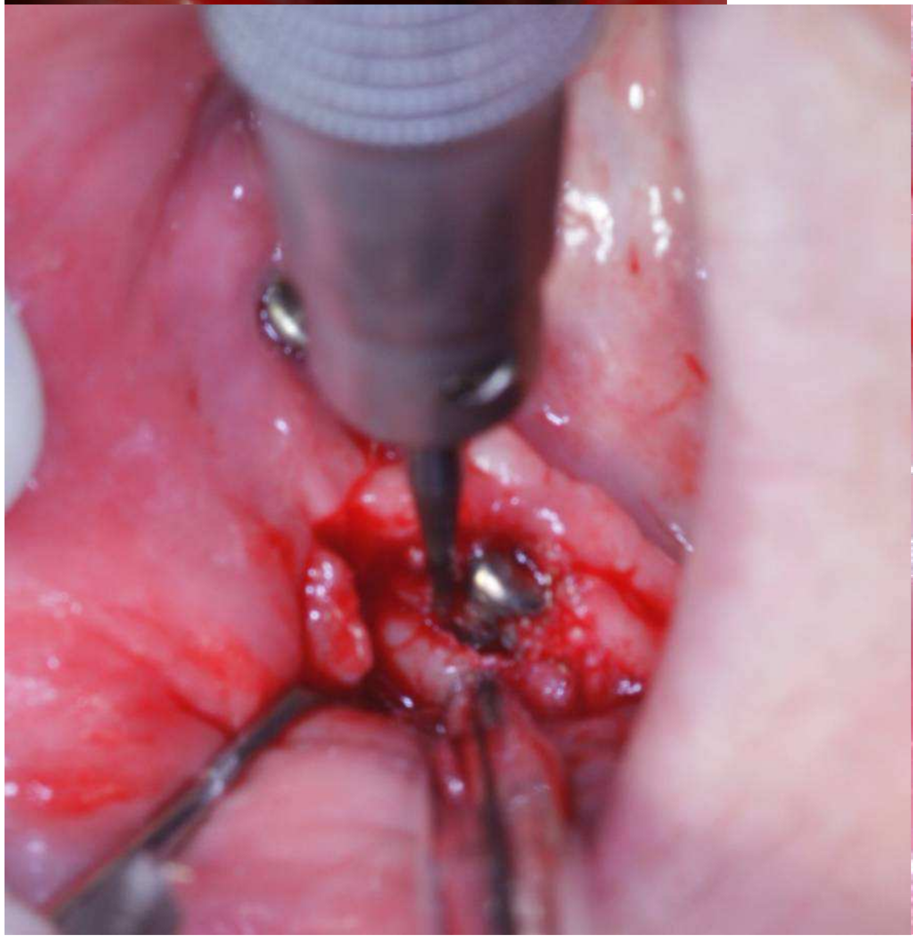
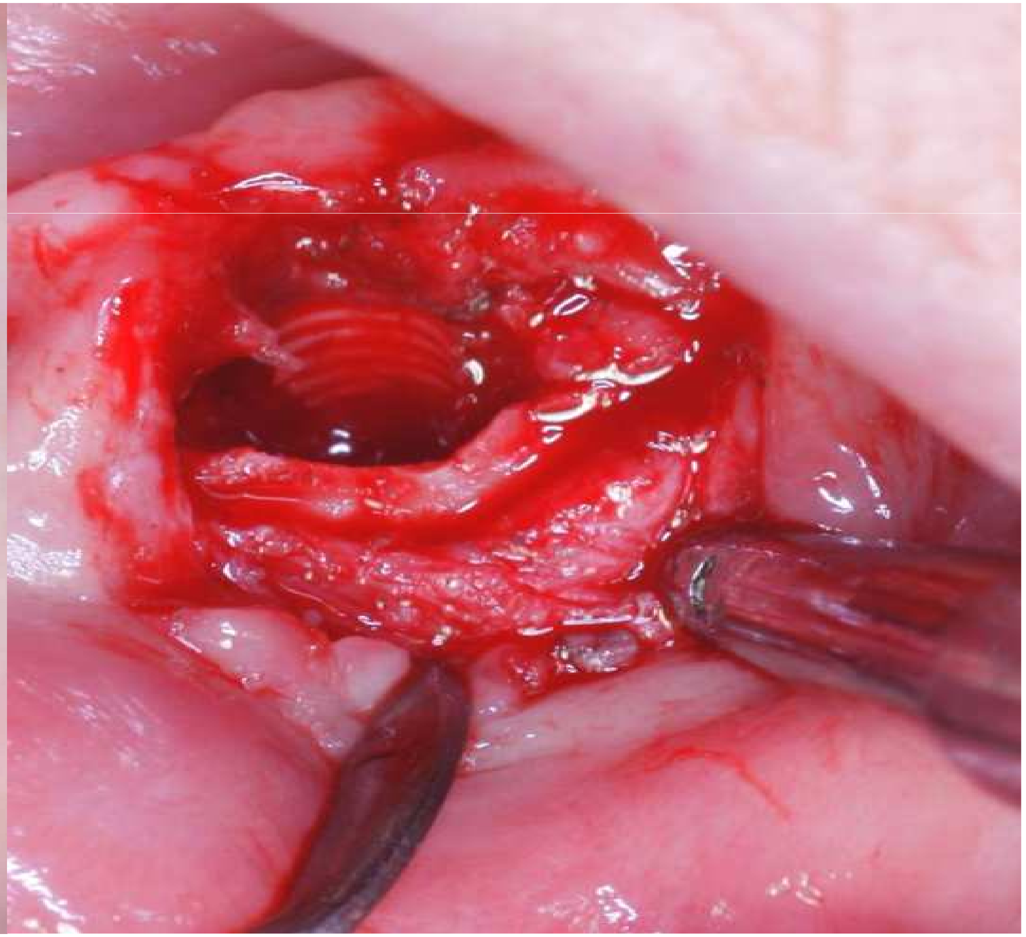
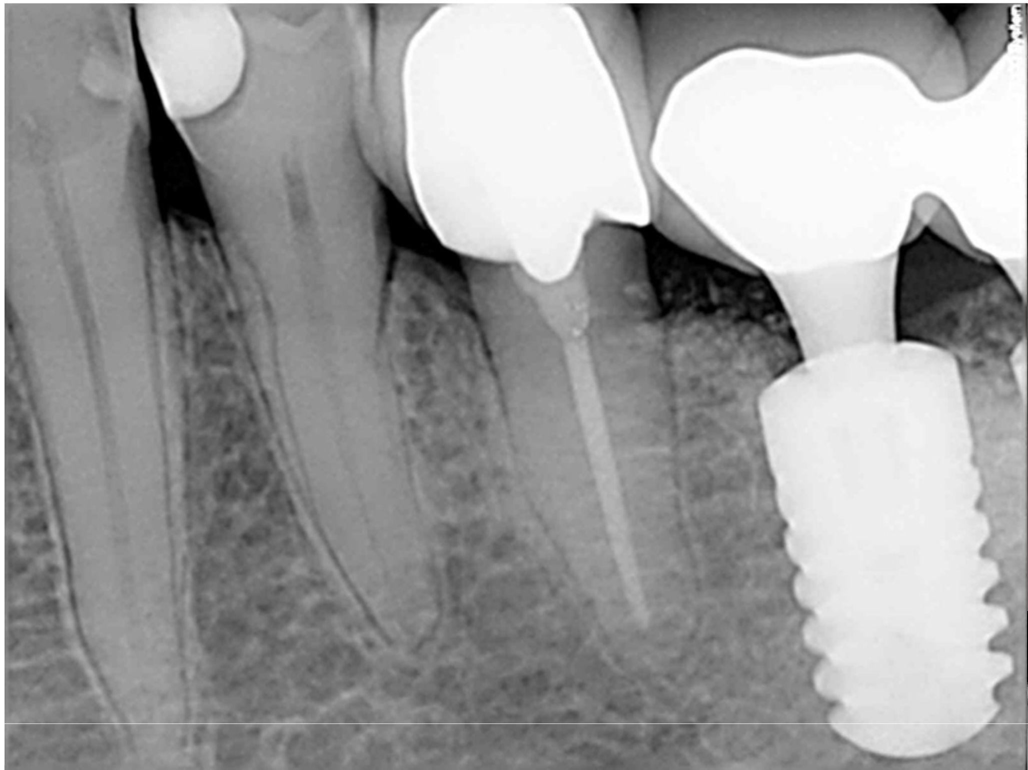
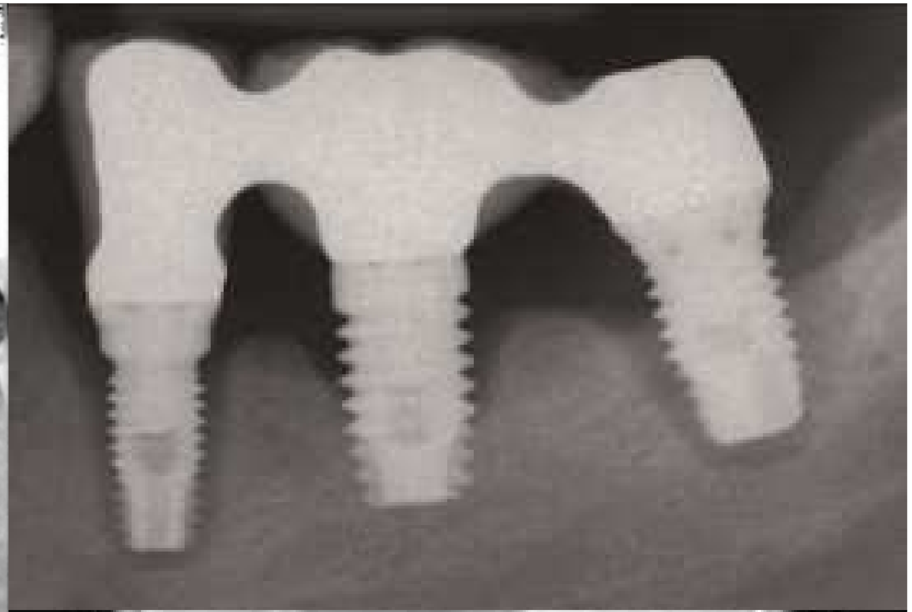
- Nome: **AM** Idade: **49a**
- Local : **Unimed de Araçatuba**
- História : **Sintomatologia região do mentoniano, devido a implante; infecção perimplantar.**
- Diagnóstico: **Implante próximo ao mentoniano**
- Conduta: **Remoção do implante inferior e regularização do rebordo + antibioticoterapia**

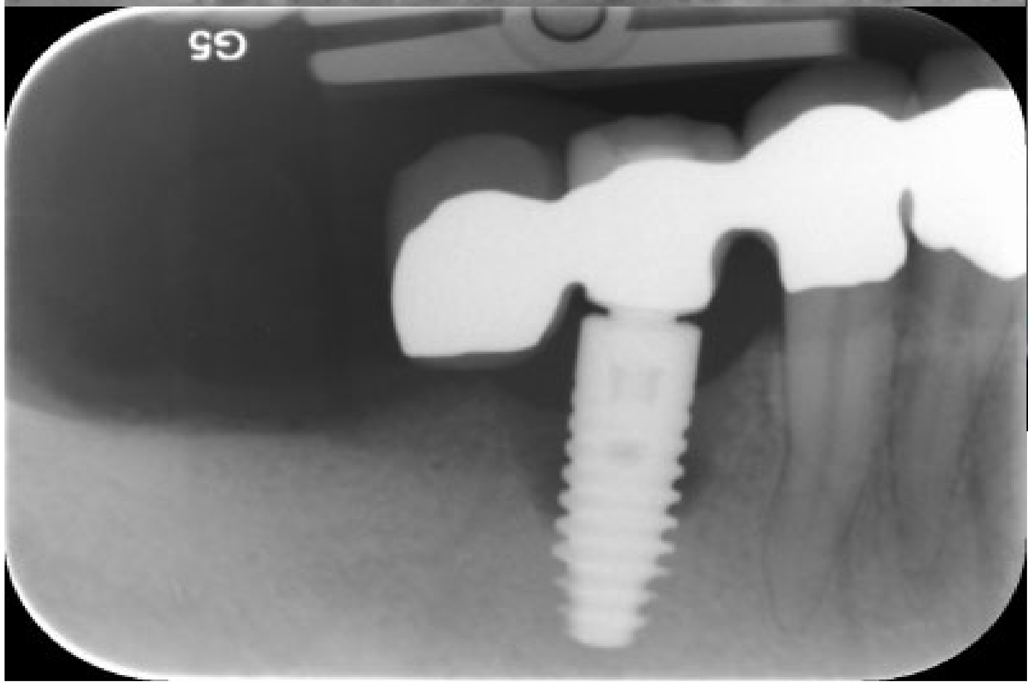
Infecções peri-implantares tardias

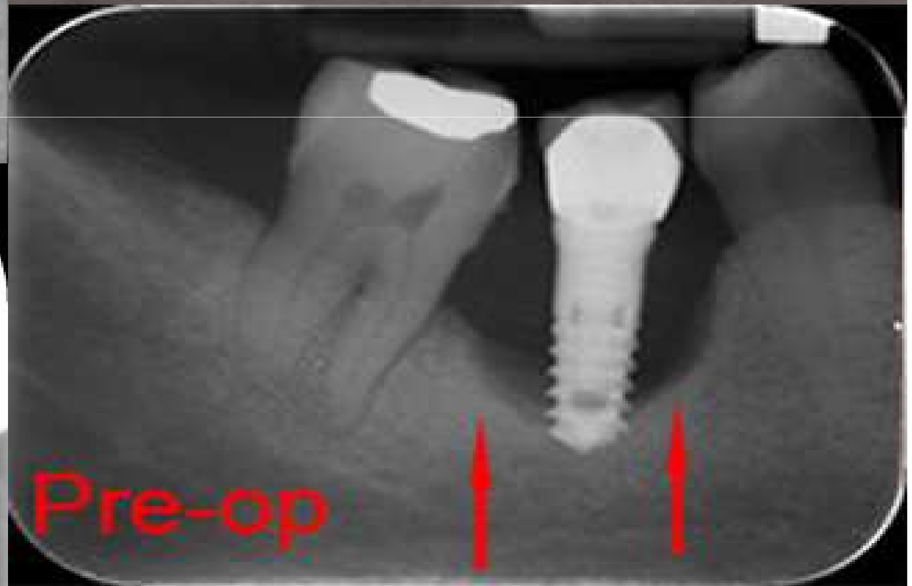






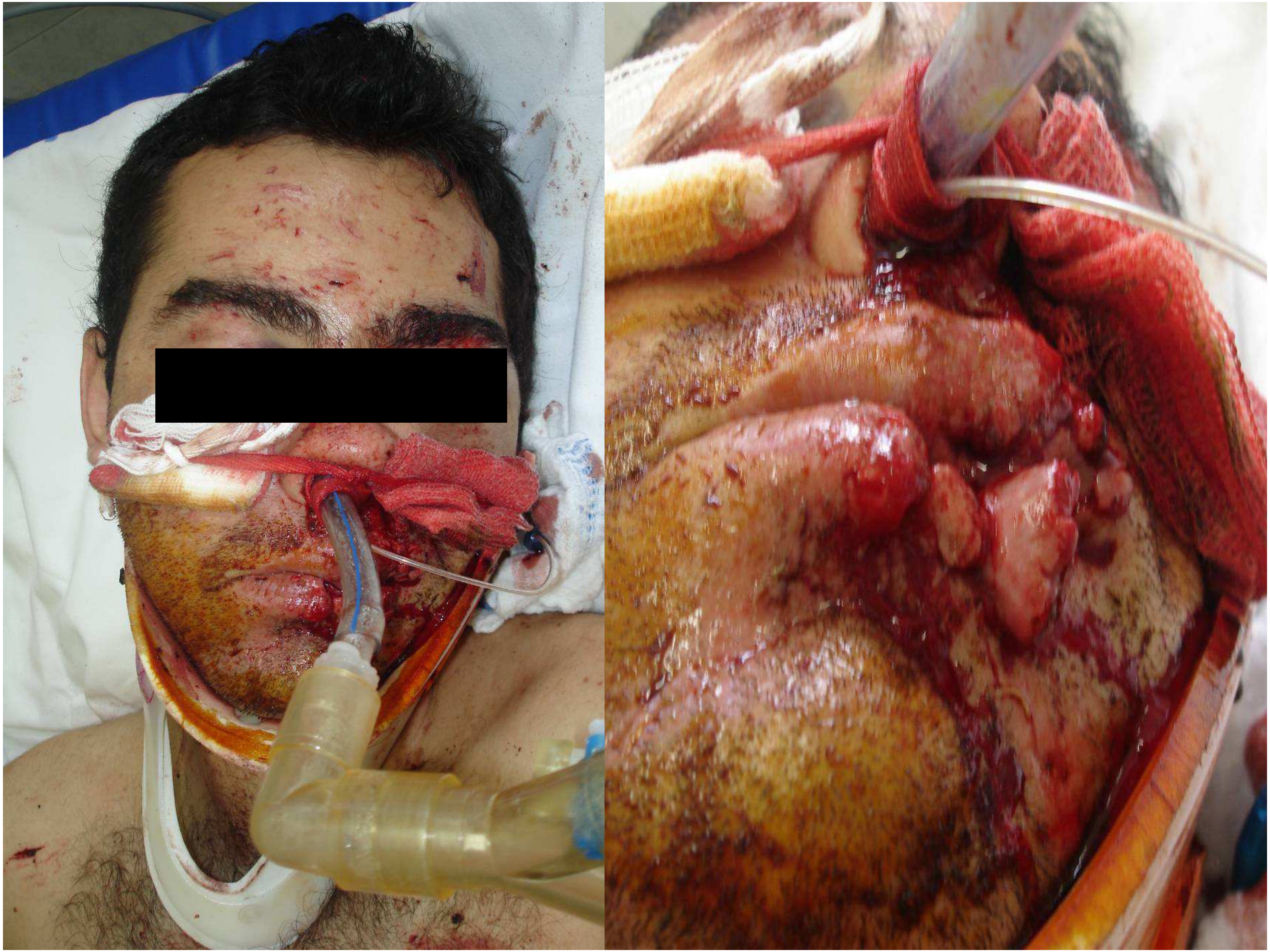


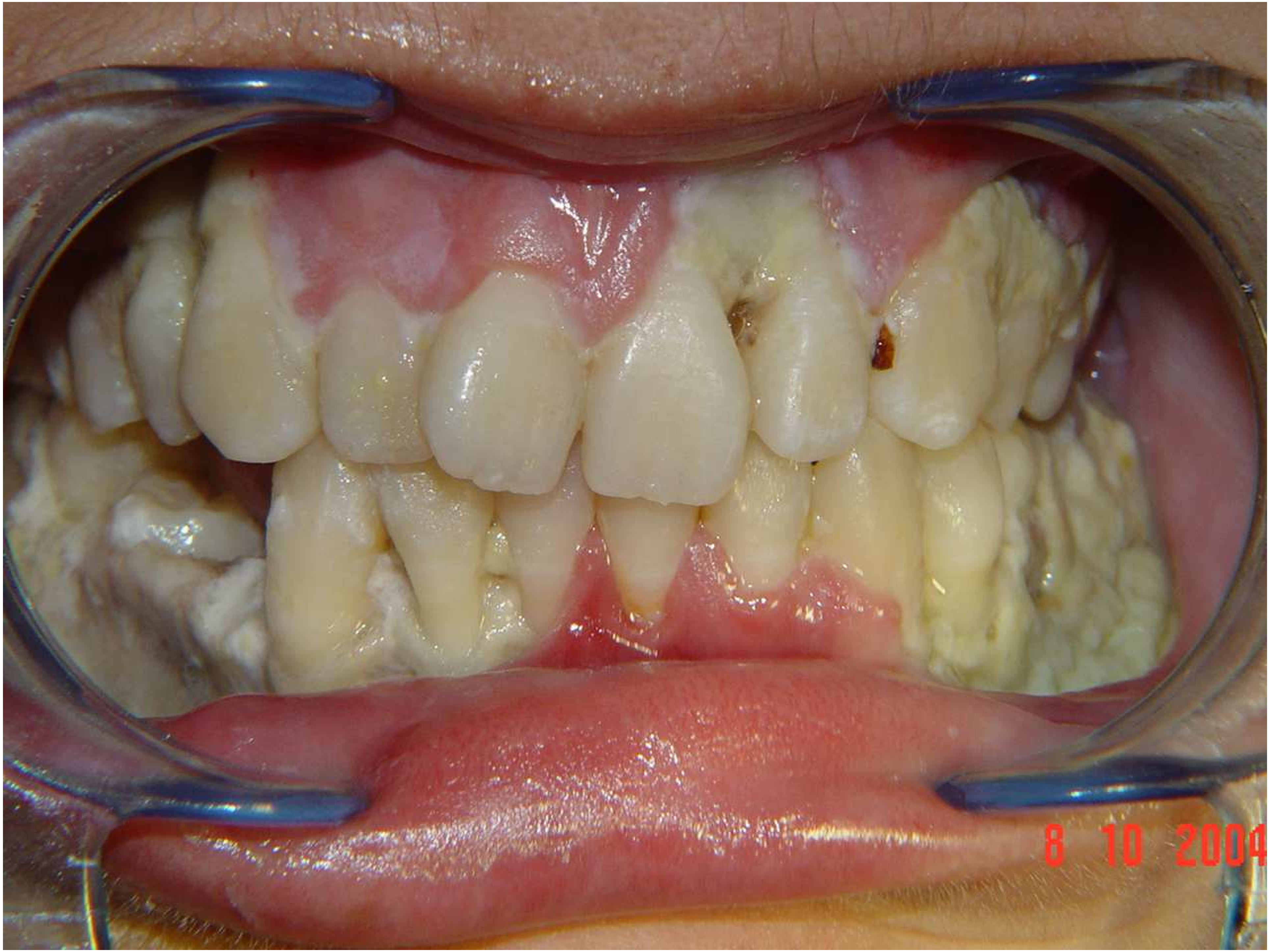




O passado pode determinar o futuro.

- **Nome: SCF**
- **Idade: 24a**
- **Local do atendimento: SCM ATA**
- **História da doença atual: acidente automobilístico**
- **Diagnóstico: FLC e septicemia por anaeróbios**
- **Conduta: 19/02/10 - Avaliação clínica e radiográfica. Sutura dos ferimentos. Segue aos cuidados da equipe médica (UTI).**
- **Microbiota: *F. nucleatum, P. intermedia***

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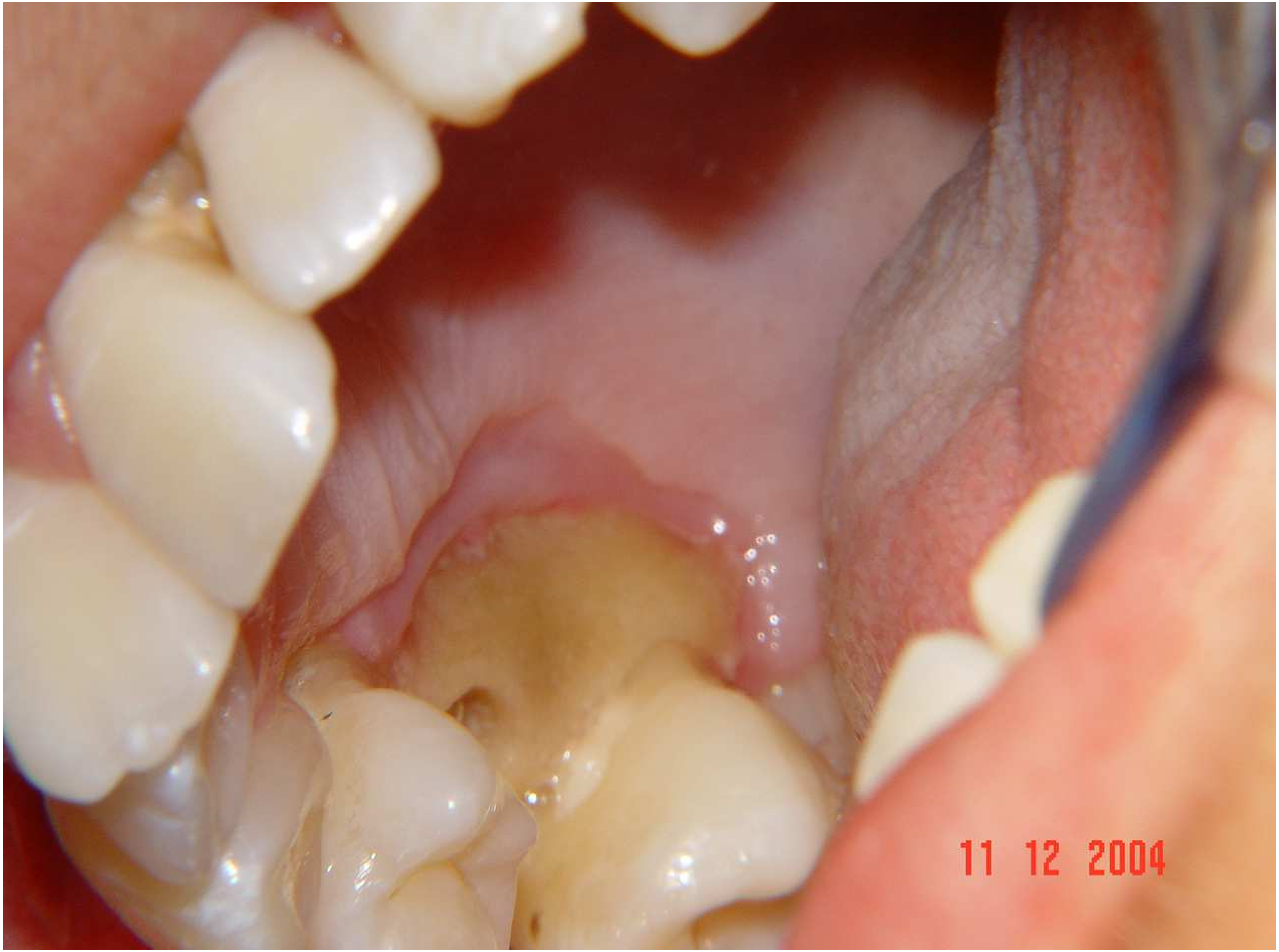
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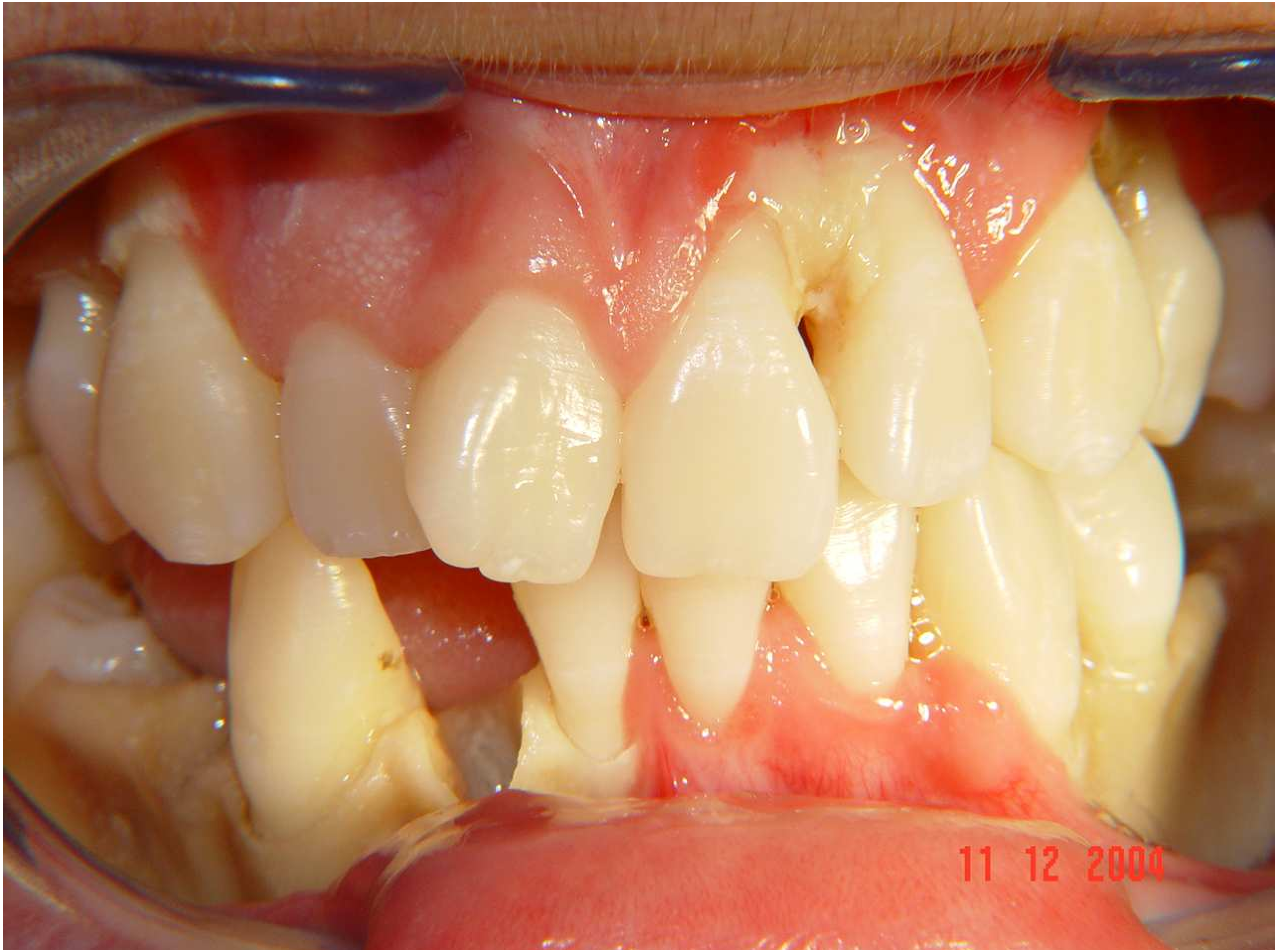
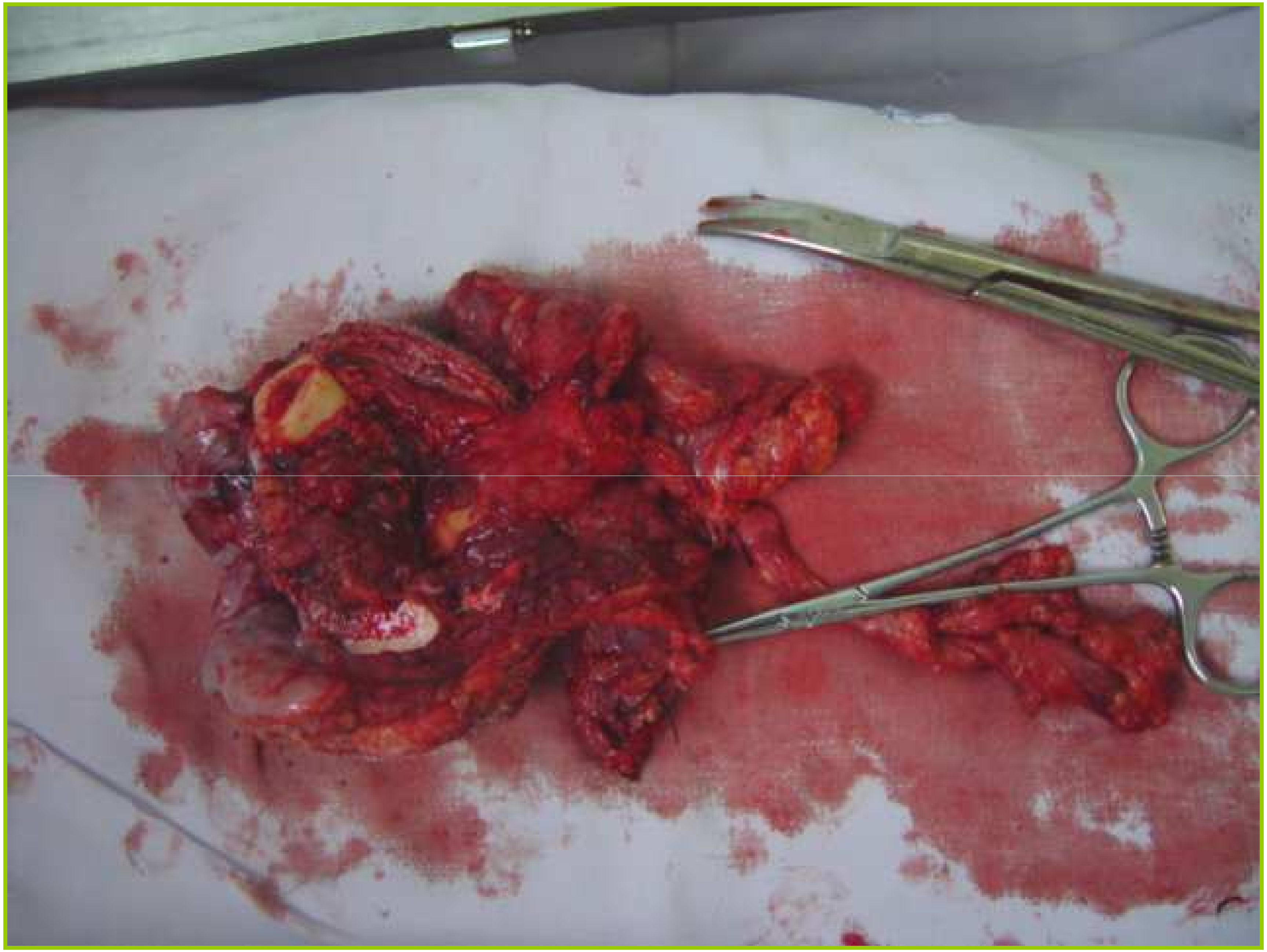
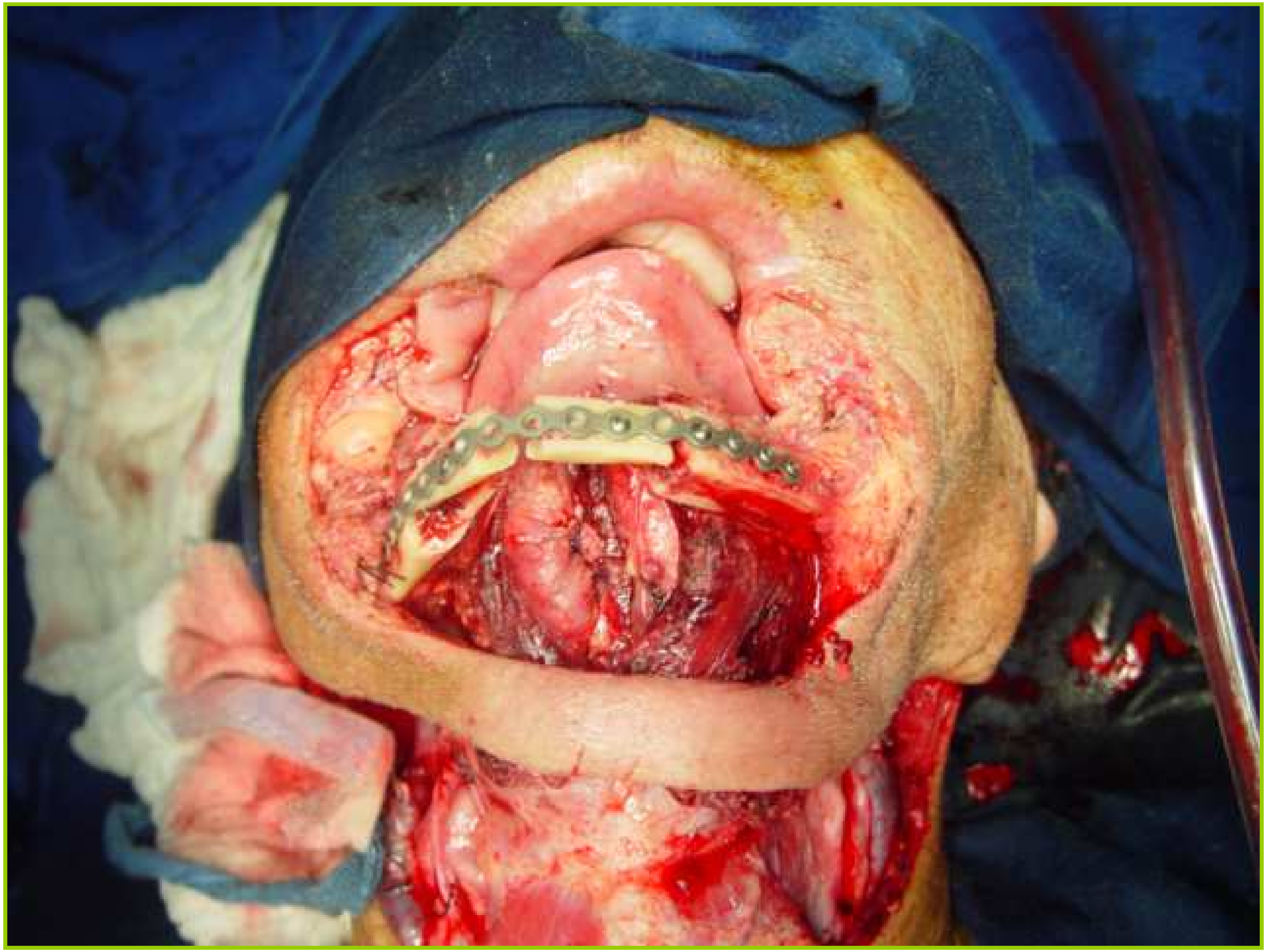

11 12 2004

- **Nome: J. L. (76 anos).**
- **Local do atendimento: Santa Casa de Araçatuba (17/02).**
- **História da doença atual: lesão ulcerada, dolorosa e 10 cm de diâmetro em região mentoniana há 2 anos e osteomielite mandibular.**
- **Diagnóstico sugerido: Carcinoma espinocelular**

Conduta: Avaliação clínica e radiográfica. Cirurgia para mandibulectomia parcial. Reconstrução com placa de titânio e enxerto.

- **Microbiota: actinomicetos e bastonetes anaeróbios Gram-negativos (BAPPN)**





Disseminação das infecções mandibulares

espaços submentonianos

edema da faringe e asfixia

mediastino

Infecção maciça dos pulmões ou pericardite

Rana & Moonis, 2011

Disseminação das infecções maxilares

celulites ou abscessos nas órbitas

seio cavernoso

BAPPN produtores de heparinase e outros anaeróbios

seio maxilar

Rana & Moonis, 2011

Alveolite supurativa

Head and Neck Infection and Inflammation

Rich S. Rana, MD[a], Gul Moonis, MD[b,c,*]

Radiol Clin N Am 49 (2011) 165–182
doi:10.1016/j.rcl.2010.07.013

Fig. 5. Masticator space infection. Coronal contrast-enhanced computed tomography demonstrates right masticator space abscess (*asterisk*) originating from an odontogenic infection of the maxillary molar (*arrow*).

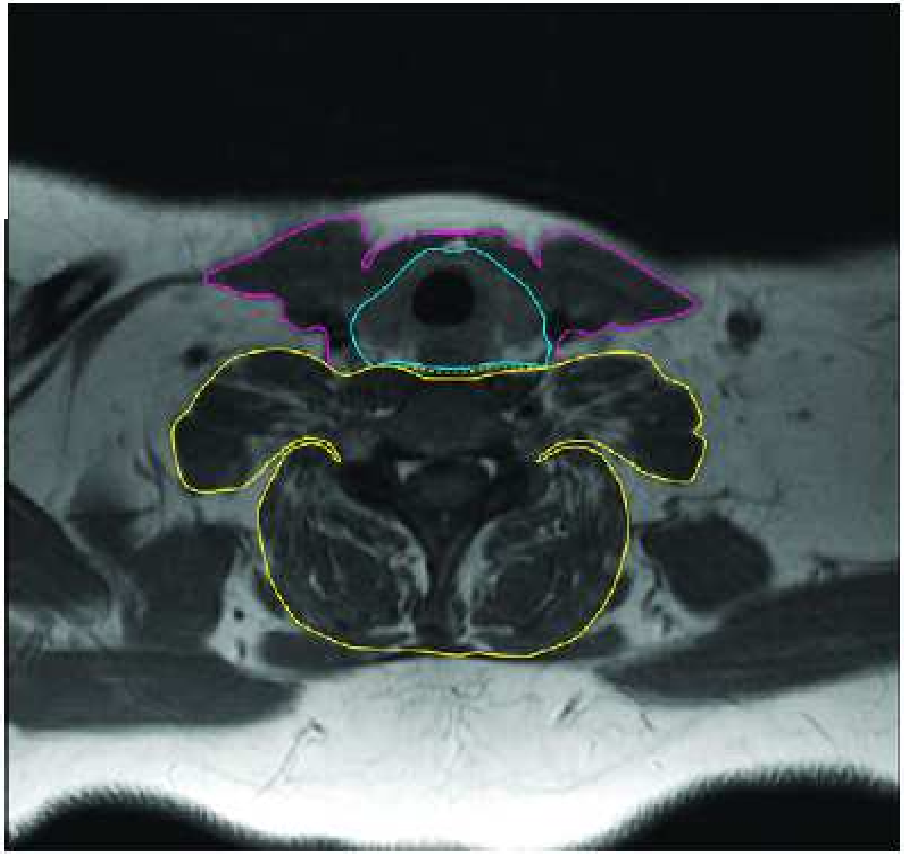


Fig. 1. Layers of deep cervical fascia. The strap muscles and sternocleidomastoid muscle are enclosed by the superficial layer of deep cervical fascia (*pink*). The visceral space is enveloped by the middle, or visceral, layer of deep cervical fascia (*blue*). The deep layer of deep cervical fascia (*yellow*) surrounds the paraspinal and prevertebral components of the perivertebral space. From anterior to posterior, the retropharyngeal and danger spaces are separated by the alar fascia (*yellow dashed line*), which is part of the deep cervical fascia.

⇨**Nome: FCS**

⇨ **Idade: 23 anos**

⇨ **Local do atendimento: PS SCM Araçatuba.**

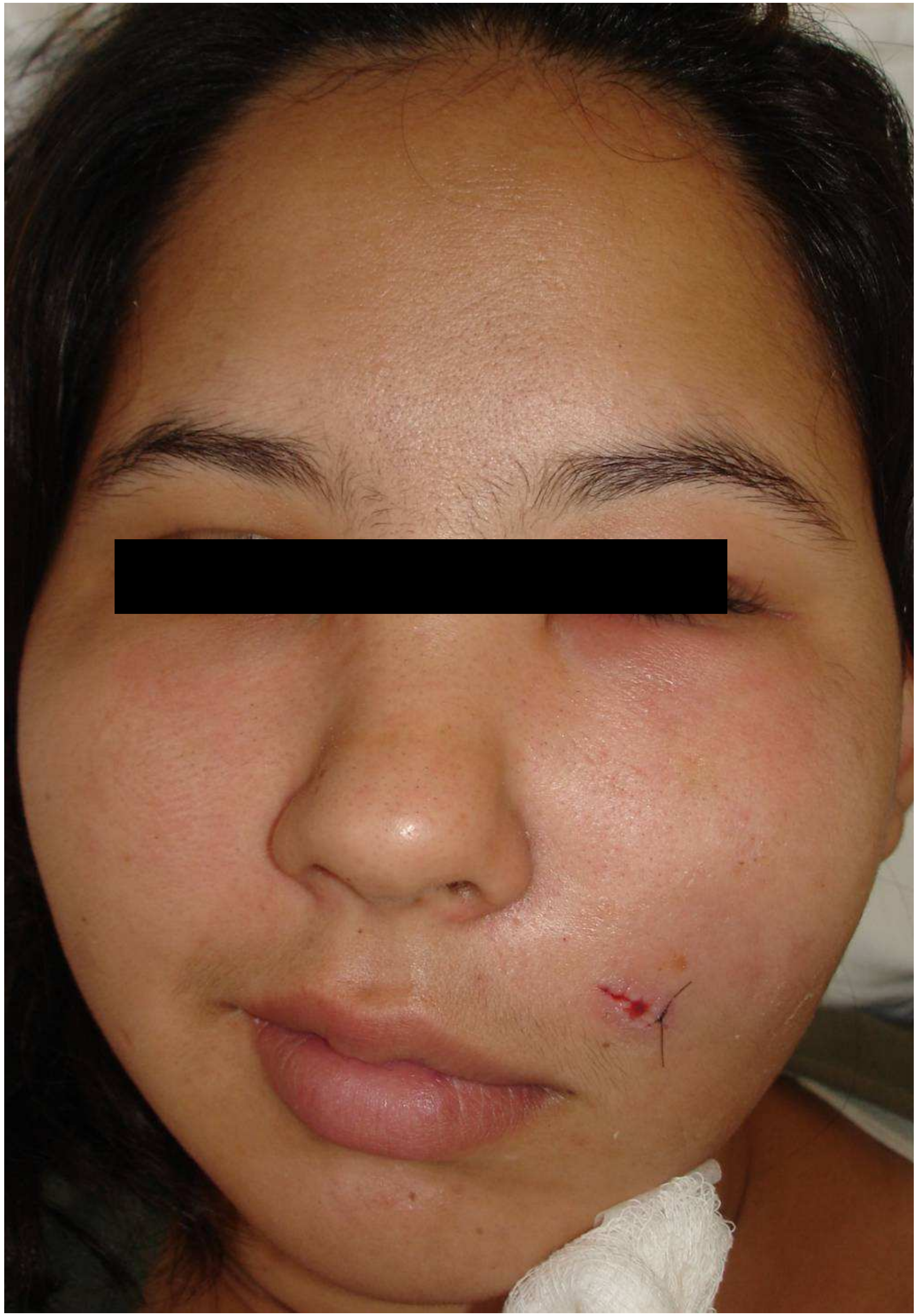
⇨ **História da doença atual: Abscesso cutâneo com tempo de evolução de 05 dias**

⇨ **Diagnóstico: abscesso após “mordida de cão”**

⇨ **Conduta: 22/01/09 – Avaliação clínica, drenagem de coleção purulenta, lavagem copiosa SF 0.9%, instalação de PEN ROSE, internação e antibioticoterapia.**

Gaetti-Jardim et al., 2014

Gaetti-Jardim et al., 2014



PARTICIPAÇÃO DE ANAERÓBIOS NAS INFECÇÕES ENDODÔNTICAS E PERIAPICAIS

Clinical Research

2016

Host-Bacterial Interactions in Post-treatment Apical Periodontitis: A Metaproteome Analysis

José Claudio Provenzano, PhD, Henrique S. Antunes, PhD,*† Flávio R.F. Alves, PhD,* Isabela N. Rôças, PhD,* Wilber S. Alves, MSc,‡ Márcia R.S. Silva, PhD,‡ and José F. Siqueira, Jr, PhD**

Clinical Research

Endodontic Pathogens Causing Deep Neck Space Infections: Clinical Impact of Different Sampling Techniques and Antibiotic Susceptibility

2011

Paul W. Poeschl, MD, DMD, Valentina Crepaz, DMD,* Guenter Russmueller, MD,* Rudolf Seemann, MD, DMD, MSc,* Alexander M. Hirschl, MD,† and Rolf Ewers, MD, DMD, PhD**

Importância do método de coleta

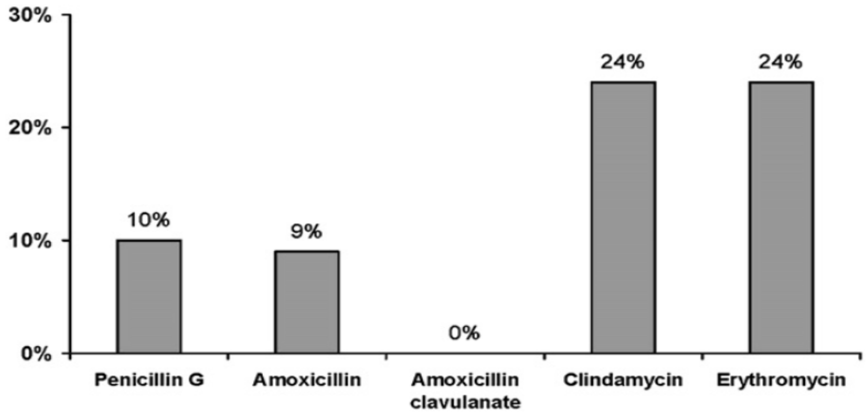


Figure 2. The overall resistance rates for the leading pathogens (streptococci, staphylococci, *Prevotella, Peptostreptococcus*, and *Bacteroides*) expressed as a percentage.

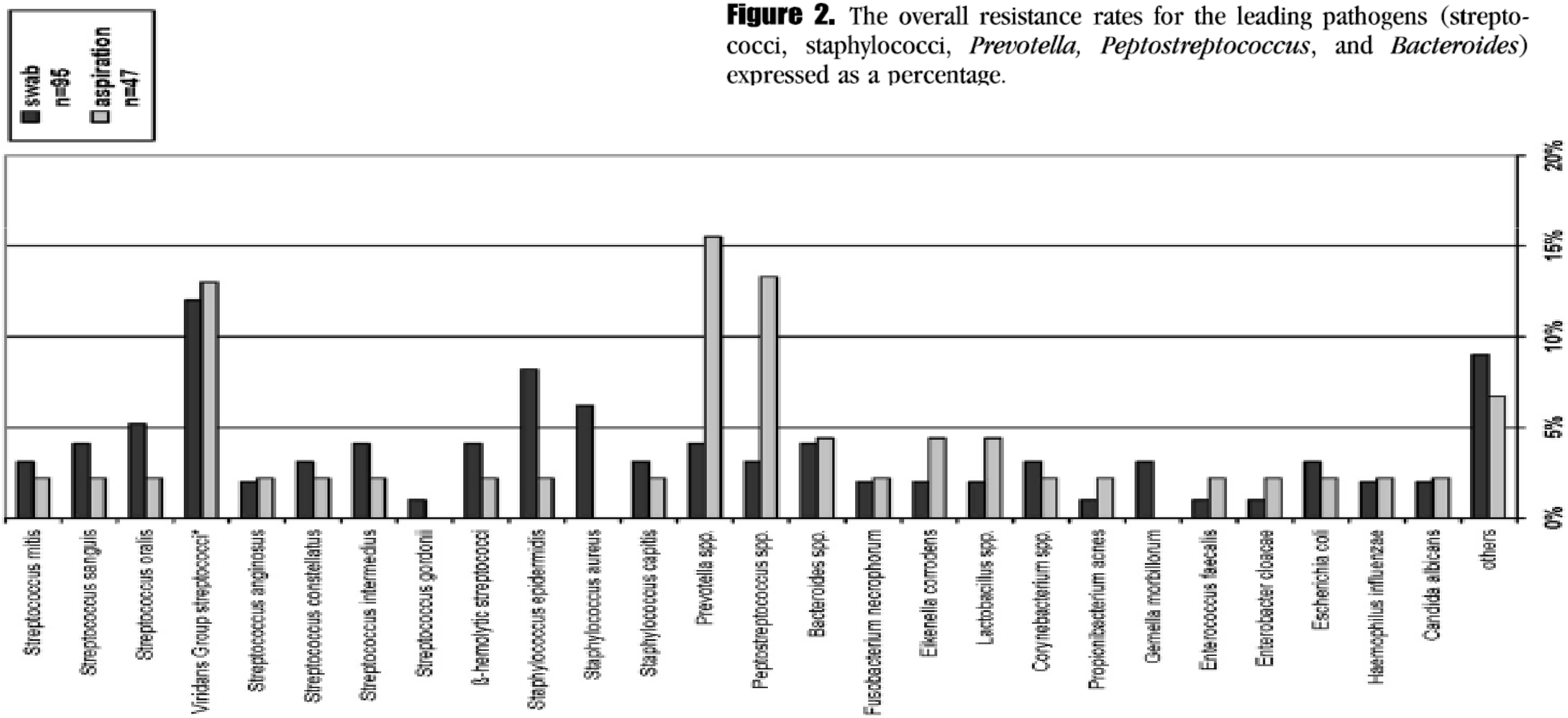
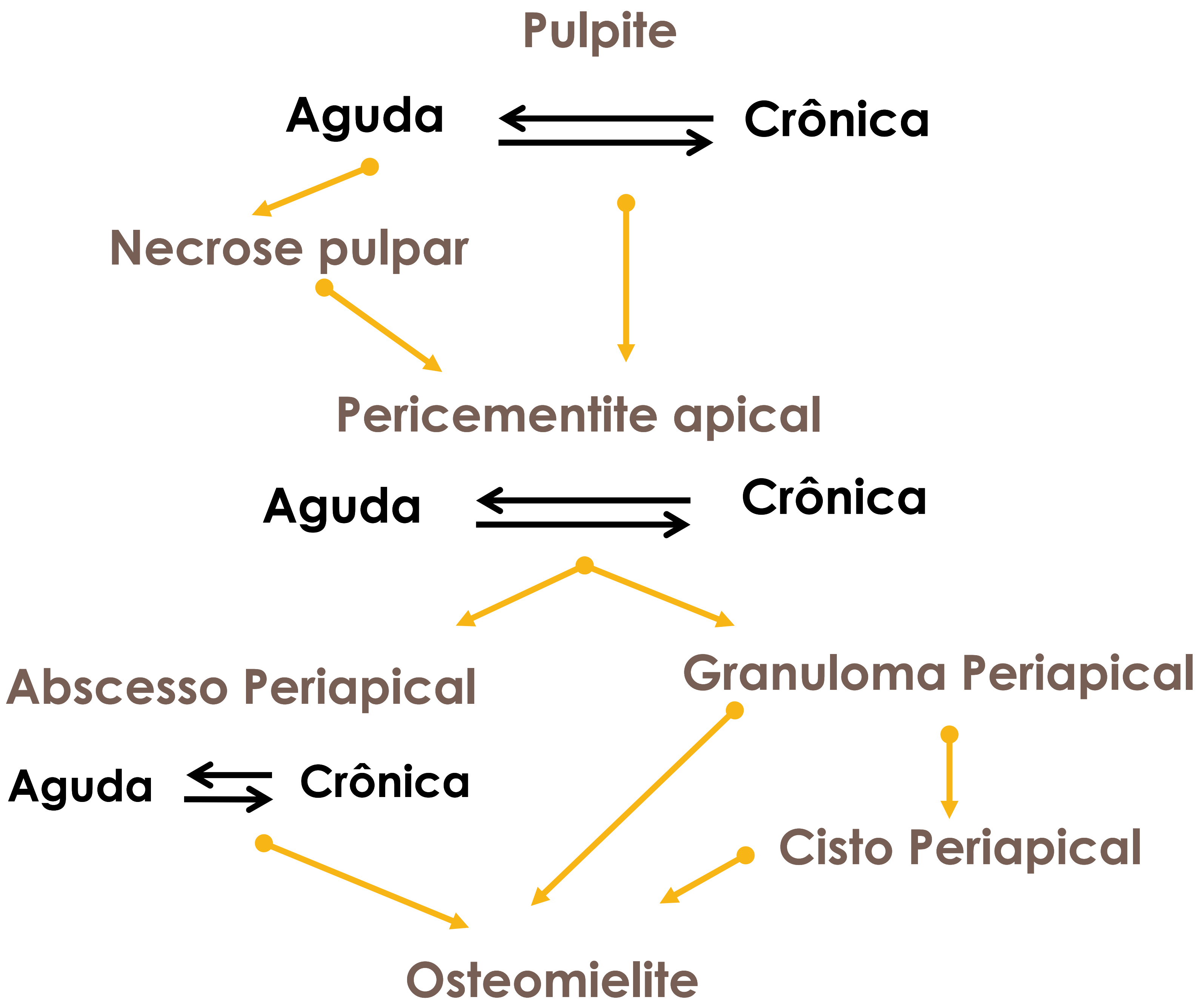


Figure 1. The distribution of the isolated bacteria (percentage) according to the sampling technique used. *This group comprises all Viridans group streptococci, which are not listed separately.


Pulpite
Aguda
Crônica
Necrose pulpar
Pericementite apical
Aguda
Crônica
Abscesso Periapical
Granuloma Periapical
Aguda
Crônica
Cisto Periapical
Osteomielite

Paciente encaminhado de serviço médico de sua cidade

Q.P.- Aumento volumétrico do lado esquerdo, dor na região, sinais flogísticos evidentes e assimetria facial

Obs- Intensa sialorréia e trismo

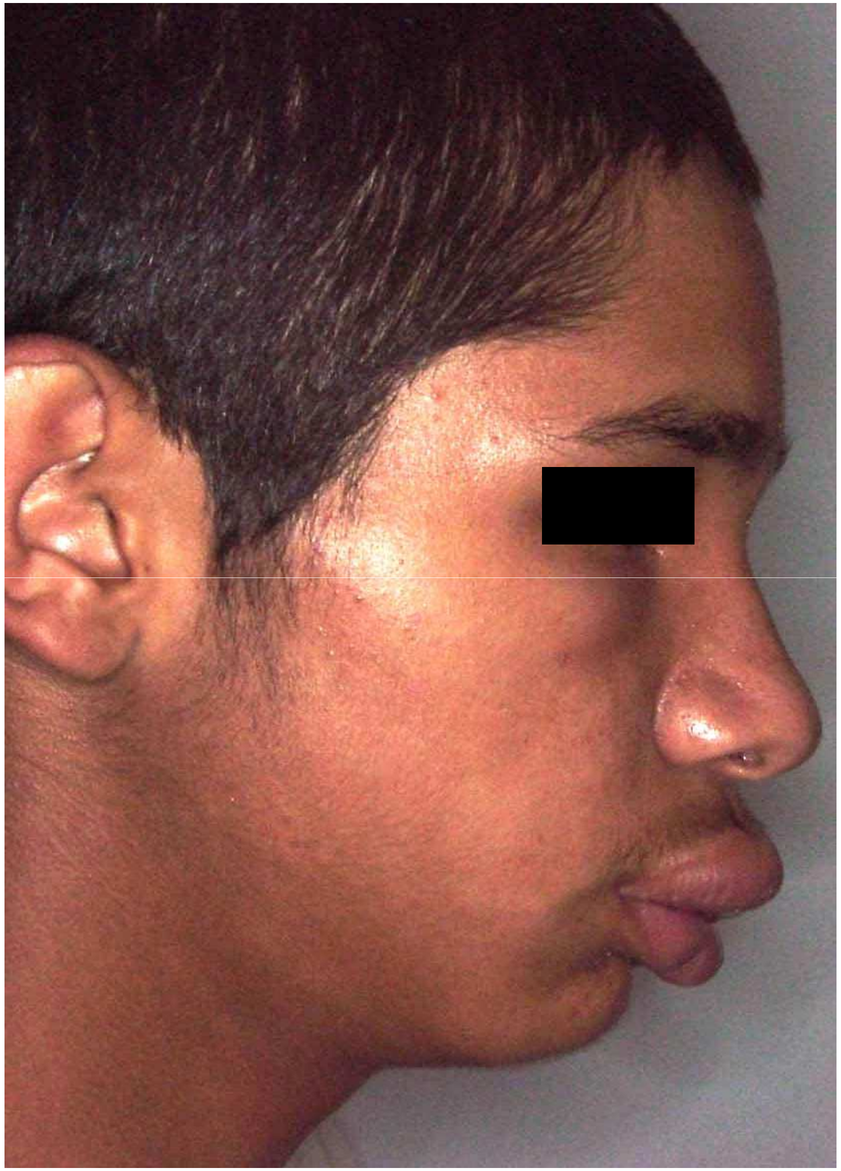
Início há 6 dias com dor no dente do lado afetado.

Medicado pelo serviço médico com Voltaren

Tinha em mãos prescrição para Benzetacil, porém ainda não havia tomado

Diagnóstico – Abscesso dentário

Feita R. X.panorâmica na Clinica e encaminhado para serviço público, devido ao recesso escolar



Microbiota da peri-implantite tardia

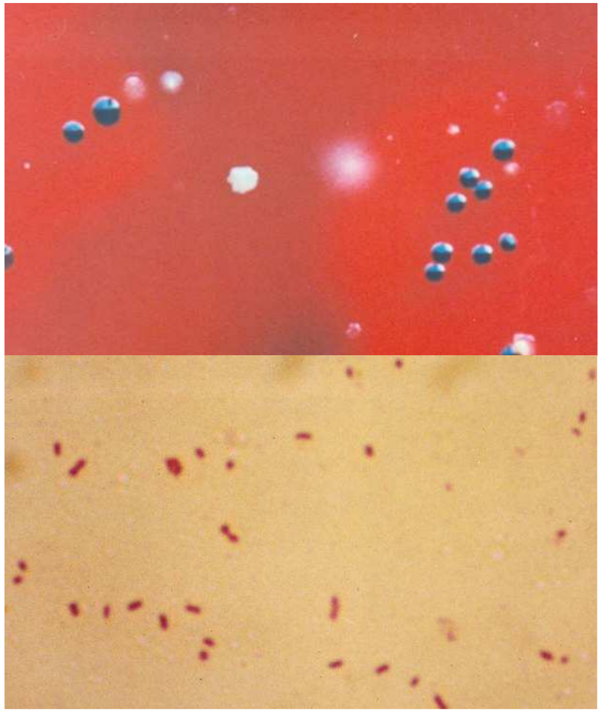
Porphyromonas gingivalis

Prevotella intermedia

Tannerella forsythia

Treponema denticola

F. nucleatum



CLINICAL IMPLANT DENTISTRY
and Related Research

Cluster of Bacteria Associated with Peri-Implantitis

2014

G. Rutger Persson, DDS, PhD;* Stefan Renvert, DDS, PhD†

TABLE 5 Bacteria Included in Final Model Assessing Bacteria in Cluster Defining Microbiological Differences by Implant Status (Peri-Implantitis versus Health)

Variable	Regr. Coeff.	SE	Wald	Likelihood Ratio	95% Confidence Interval	Sign.
Tannerella forsythia	0.3	0.1	6.0	1.3	1.1, 1.6	0.01
Staphylococcus aureus	2.5	1.1	4.9	11.8	1.1, 53.0	0.03
Treponema socranskii	−0.2	0.2	11.1	0.8	0.6, 1.2	0.19
Porphyromonas gingivalis	0.5	0.4	1.6	1.6	0.8, 1.7	0.21

CLINICAL ORAL IMPLANTS RESEARCH

Luigi Canullo
Sandro Radovanović
Boris Delibasic
Juan Antonio Blaya
David Penarrocha
Mia Rakic

The predictive value of microbiological findings on teeth, internal and external implant portions in clinical decision making

2016

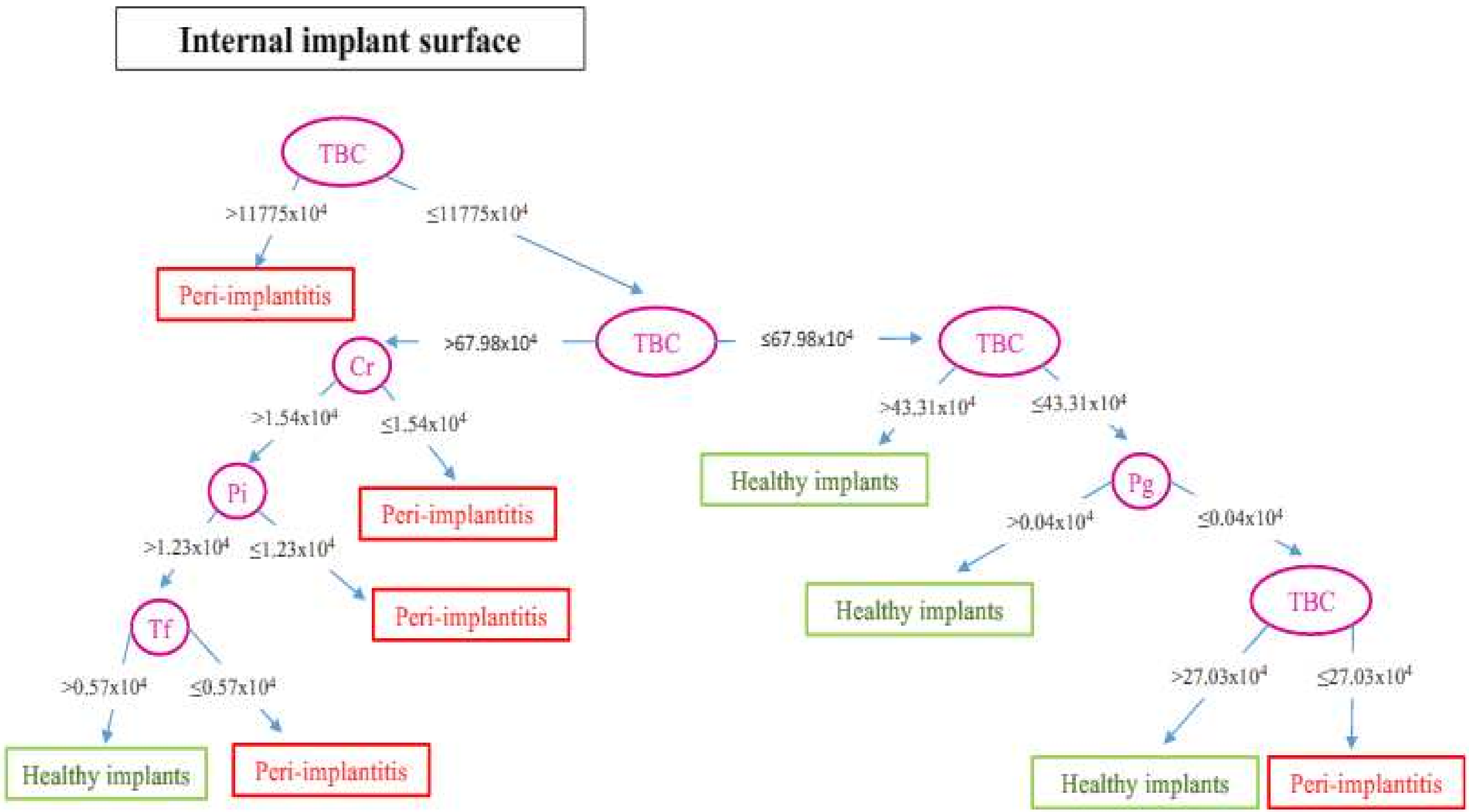


Fig. 2. Decision tree for 23 evaluated microorganism and total bacterial counts (TBC). Pg, *Porphyromonas gingivalis*; Tf, *Tannerella forsythia*; Pi, *Prevotella intermedia*; Pm, *Parvimonas micra*; Cr, *Campylobacter rectus*; Sm- *Streptococcus mitis*.

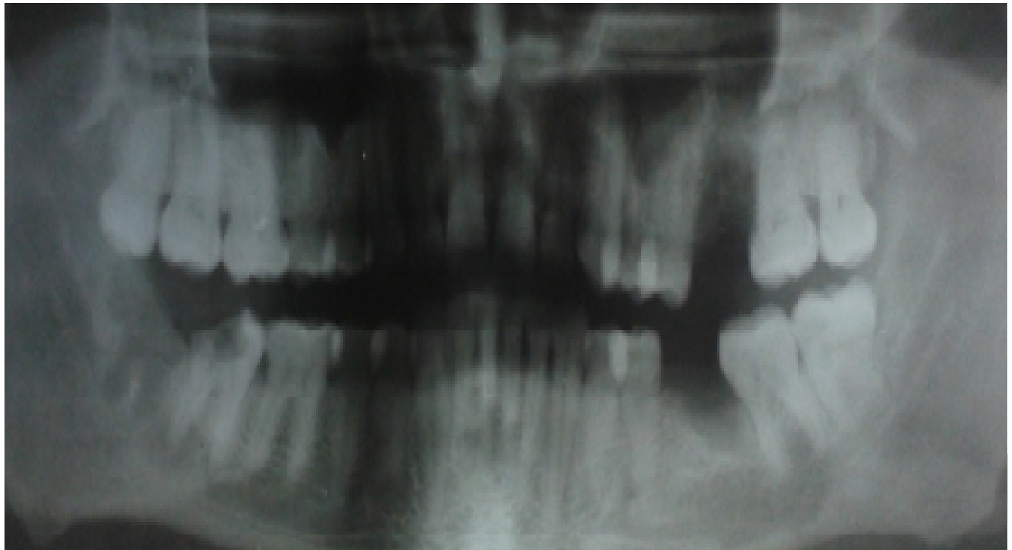
PARTICIPAÇÃO DE ANAERÓBIOS NAS INFECÇÕES ORAIS AGUDAS

CTBMF FOA-
UNESP

CTBMF
FOA-UNESP

CTBMF
NHU-UFMS

Abscesso com extensão cervical



Remoção de tecido necrótico e conteúdo séptico.

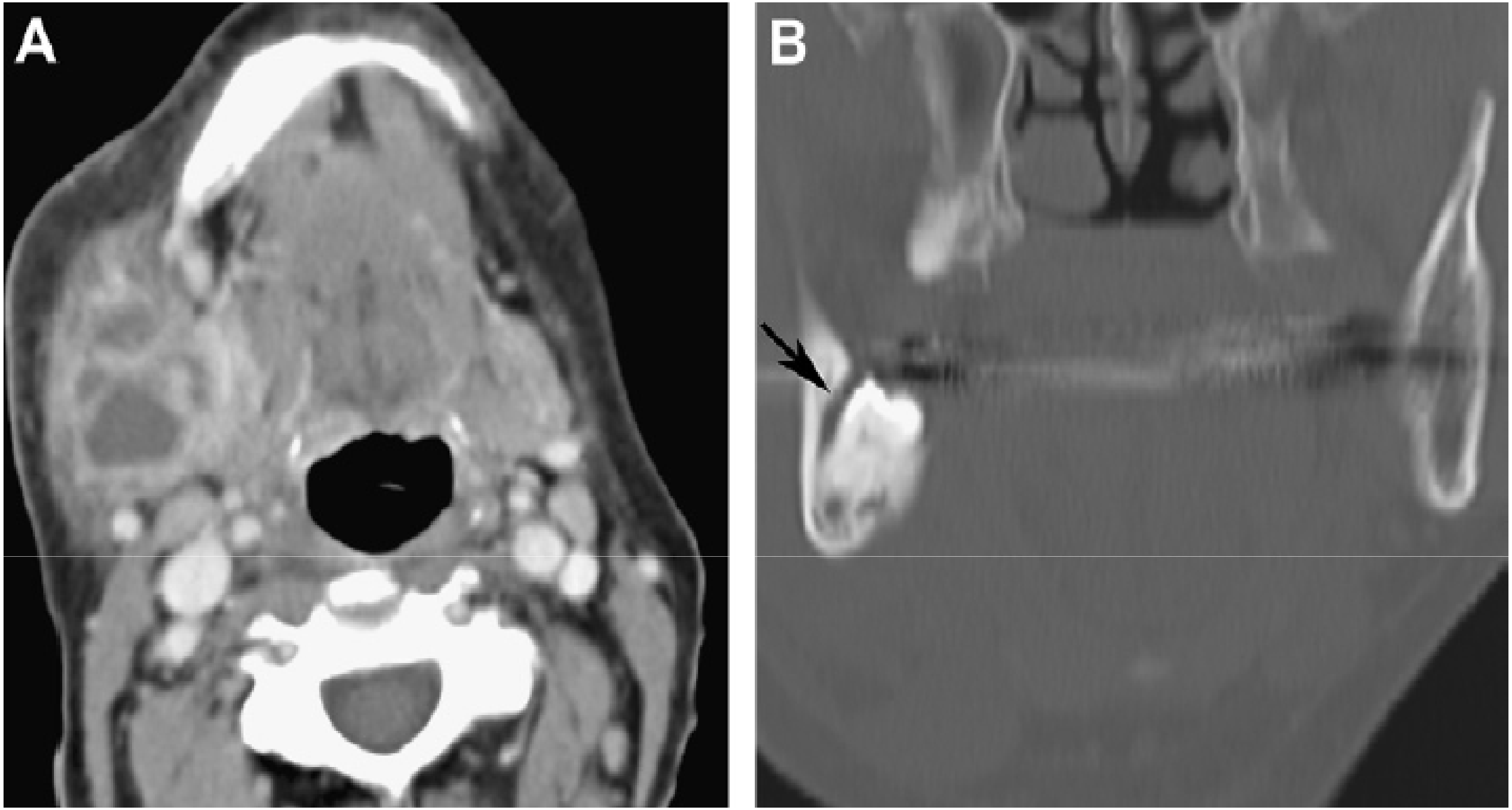


Fig. 6. Odontogenic submandibular space abscess. (*A*) Axial contrast-enhanced computed tomography demonstrates multiple low-density collections in the right submandibular space with circumferential rim enhancement as well as enlargement of the submandibular gland. (*B*) Coronal reformation with the bone window demonstrates the underlying periodontal disease (*arrow*).

Rana & Moonis, 2011

⇨**Nome: VDS** **Idade: 16 anos**

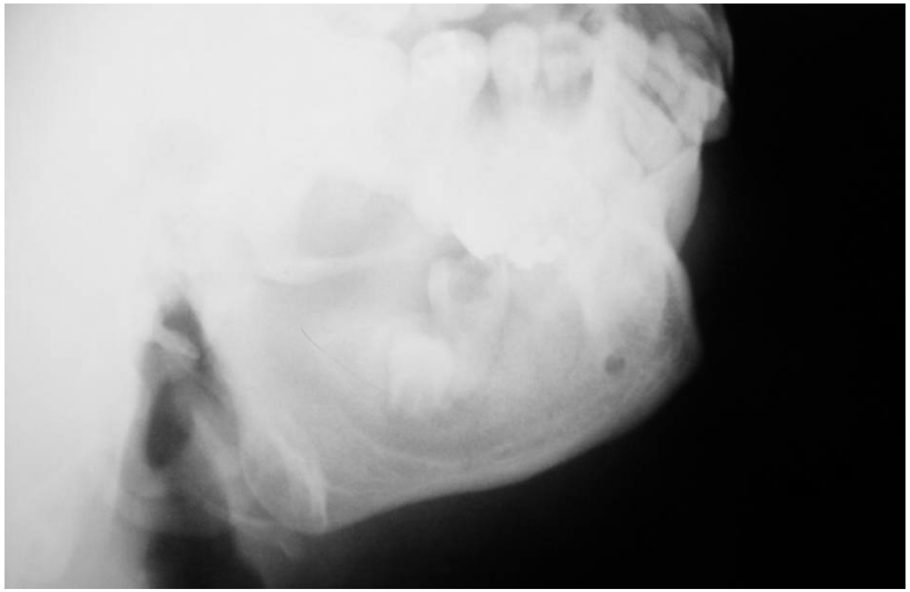
⇨ **Local do atendimento: PS SCMAta.**

⇨ **História da doença atual: Odontalgia 3.7 a 7 dias, evoluindo com tumefação submandibular esquerda, elevação de base de língua.**

⇨ **Diagnóstico: Abscesso Odontogênico**

⇨**Conduta: 21/01/09 – Avaliação clínica, internação e antibioticoterapia.**








CTBMF
SCM – Araçatuba (SP)

CTBMF
SCM – Araçatuba (SP)

Infecções bucais menores????

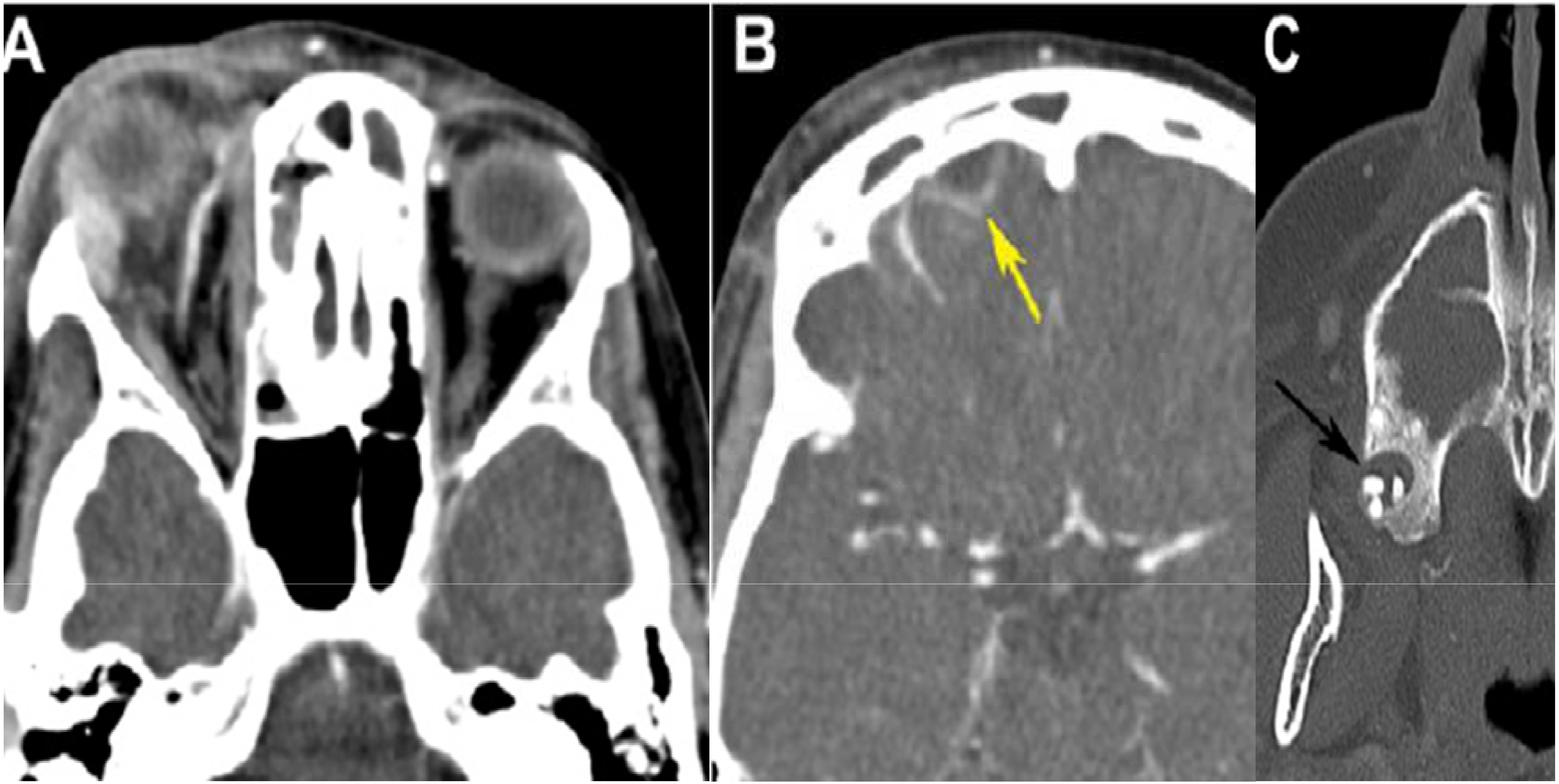


Fig. 7. Odontogenic orbital infection and epidural abscess. (*A*) Axial contrast-enhanced CT (CECT) through the right orbit demonstrates orbital cellulitis and phlegmon. (*B*) Axial CECT demonstrates an epidural abscess of the right frontal lobe (*arrow*). (*C*) Axial CECT demonstrates periapical lucency in a right maxillary molar, which was the source of infection in this patient (*arrow*). This patient also had odontogenic sinusitis of the maxillary sinus.

Rana & Moonis, 2011

Celulite

Disseminação hematogênica

- **Nome:** **VCG**
- **Local do atendimento:** **Santa Casa de Araçatuba**
- **História da doença atual:** **aumento volumétrico há 3 dias em região mandibular esquerda.**
- **Diagnóstico:** **Angina de Ludwig.**
- **Conduta:** **Avaliação clínica e radiográfica. Internação da paciente. Drenagem cirúrgica 1. – Drenagem cirúrgica 2. Exodontia do 47. Retorno realizado no ambulatório.**
- **Microbiota:** ***F. nucleatum, P. gingivalis, P. endodontalis, P. intermedia, T. denticola; S. intermedius.***

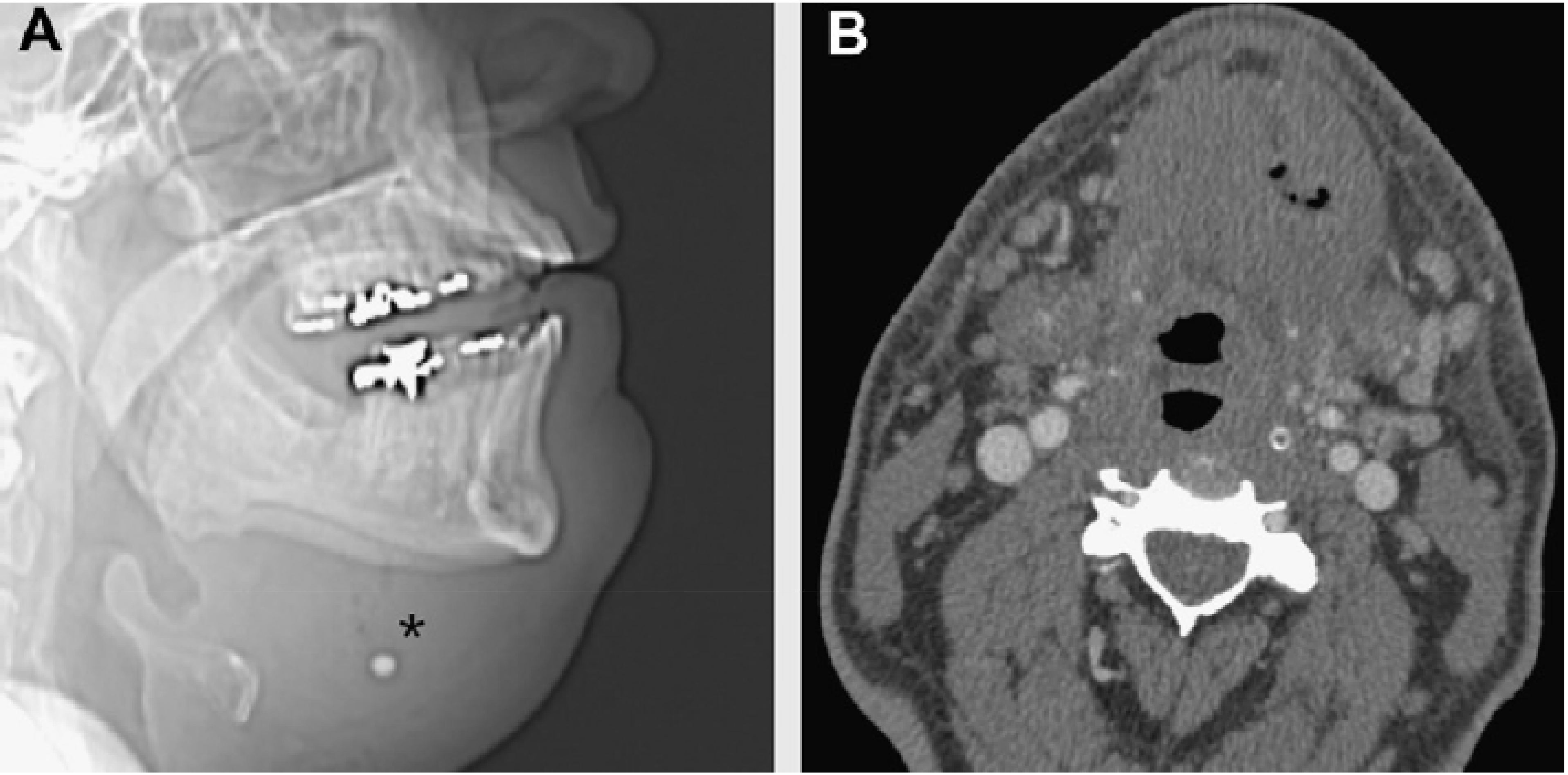
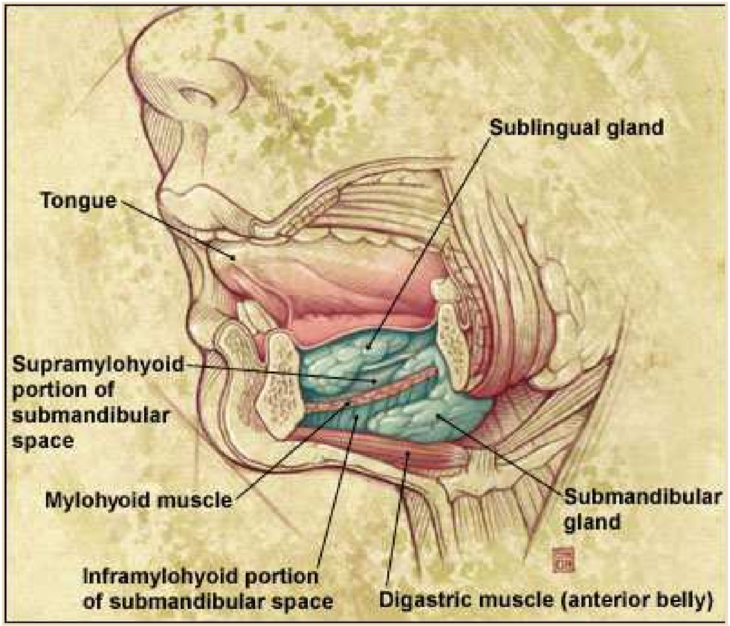
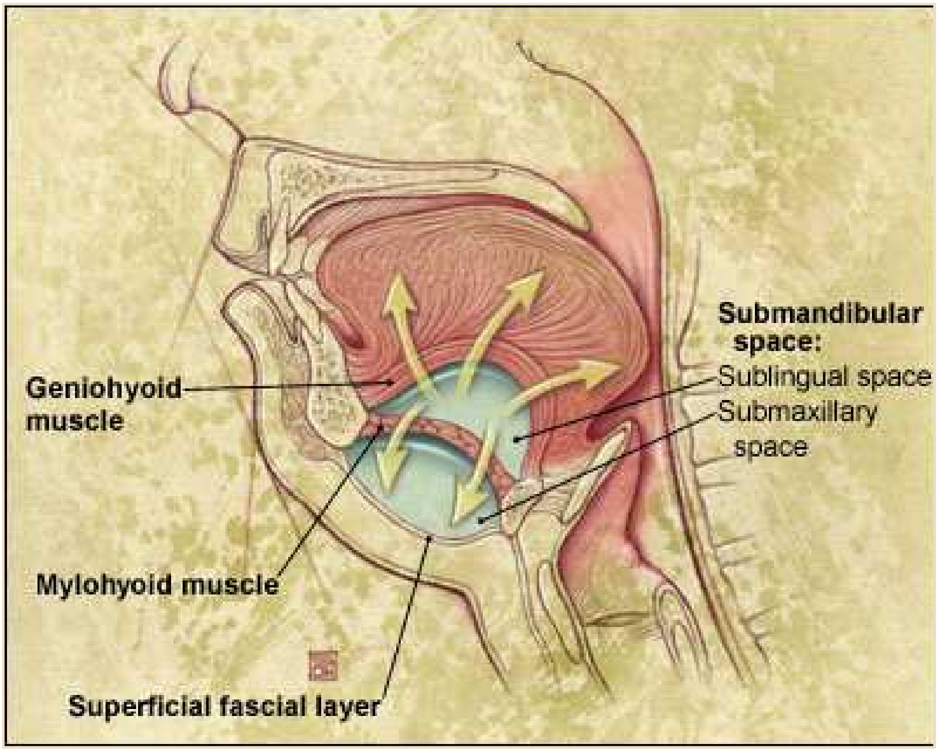


Fig. 14. Ludwig angina. (*A*) Scout CT view demonstrates submandibular space soft tissue swelling and small locules of gas (*asterisk*). (*B*) Axial contrast-enhanced CT demonstrates diffuse infiltration of the sublingual and submandibular spaces, small locules of gas, and thickening of platysma and fascial planes. The airway is mildly effaced. No discrete abscess is seen.

Rana & Moonis, 2011

Angina de Ludwig





CTBMF
NHU-UFMS

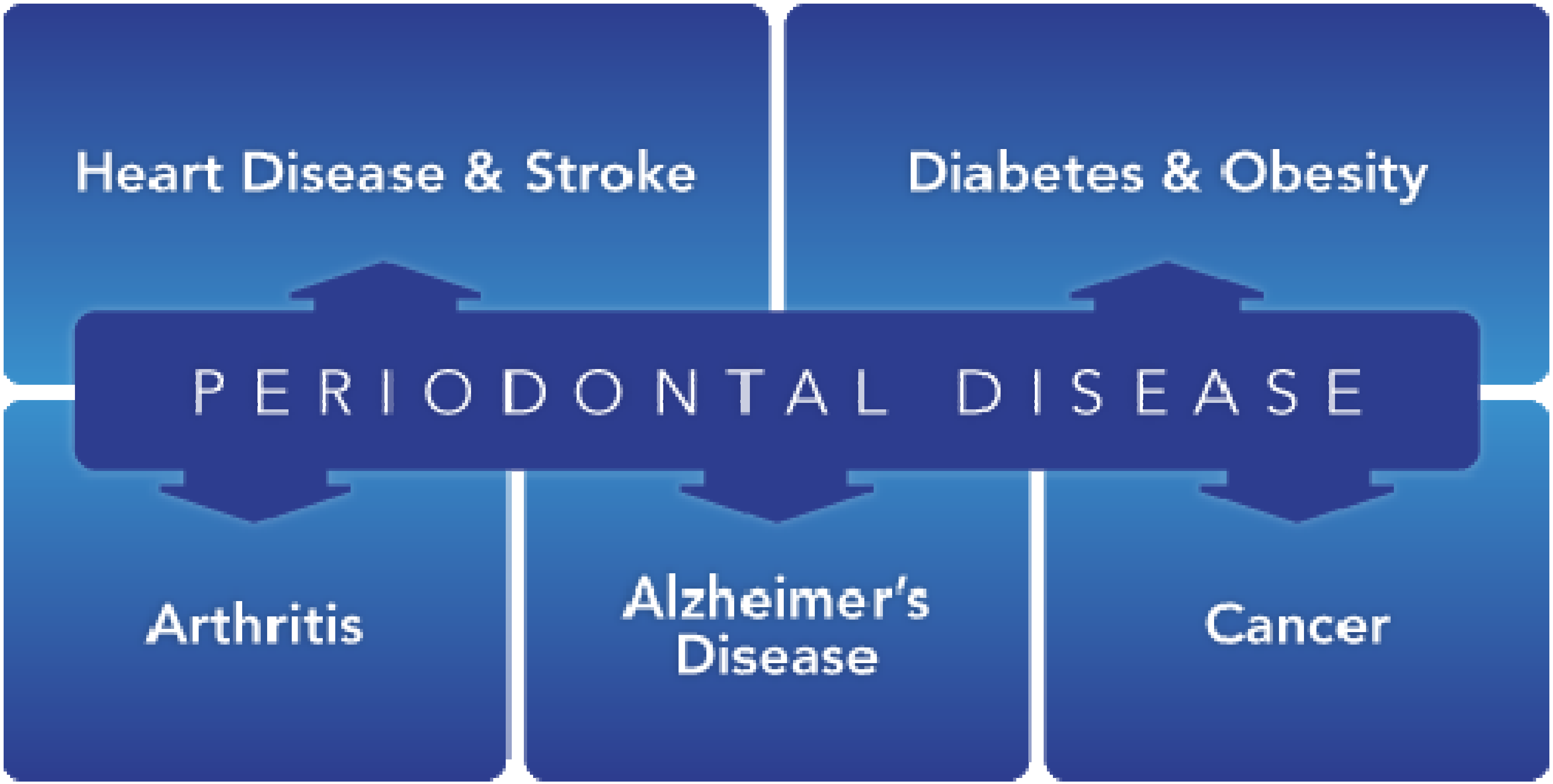
CTBMF
NHU-UFMS

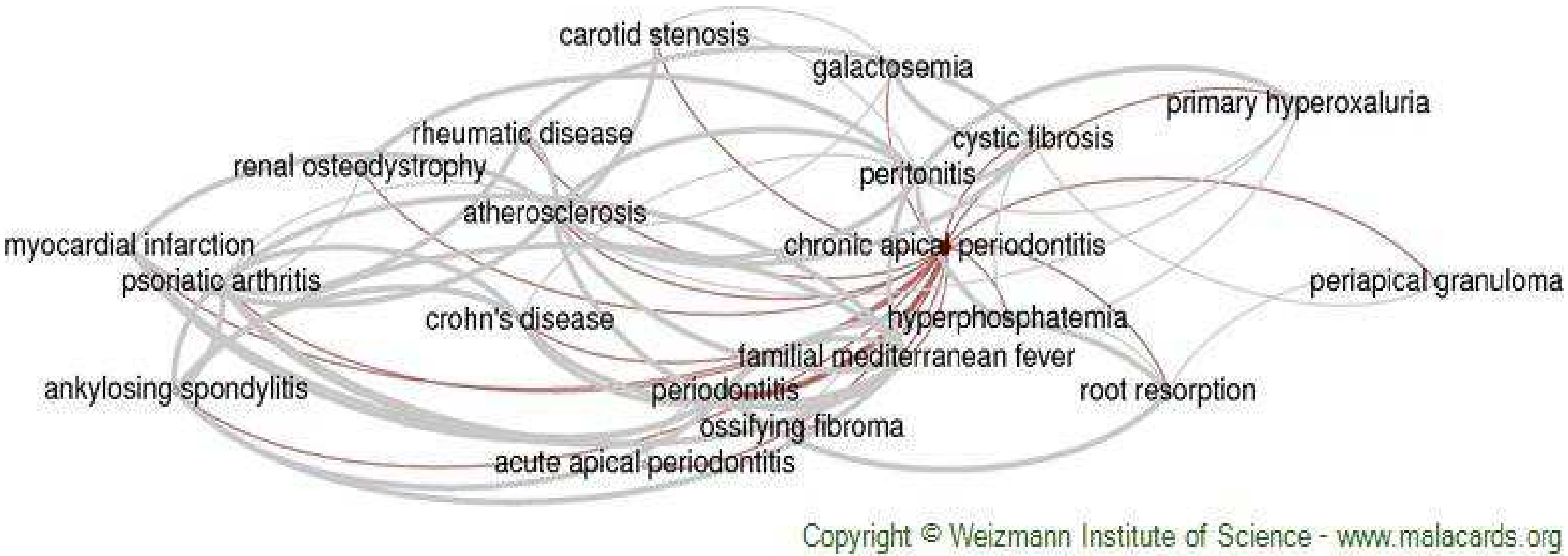
Angina de Ludwig e pericoronarite


8 3 2001

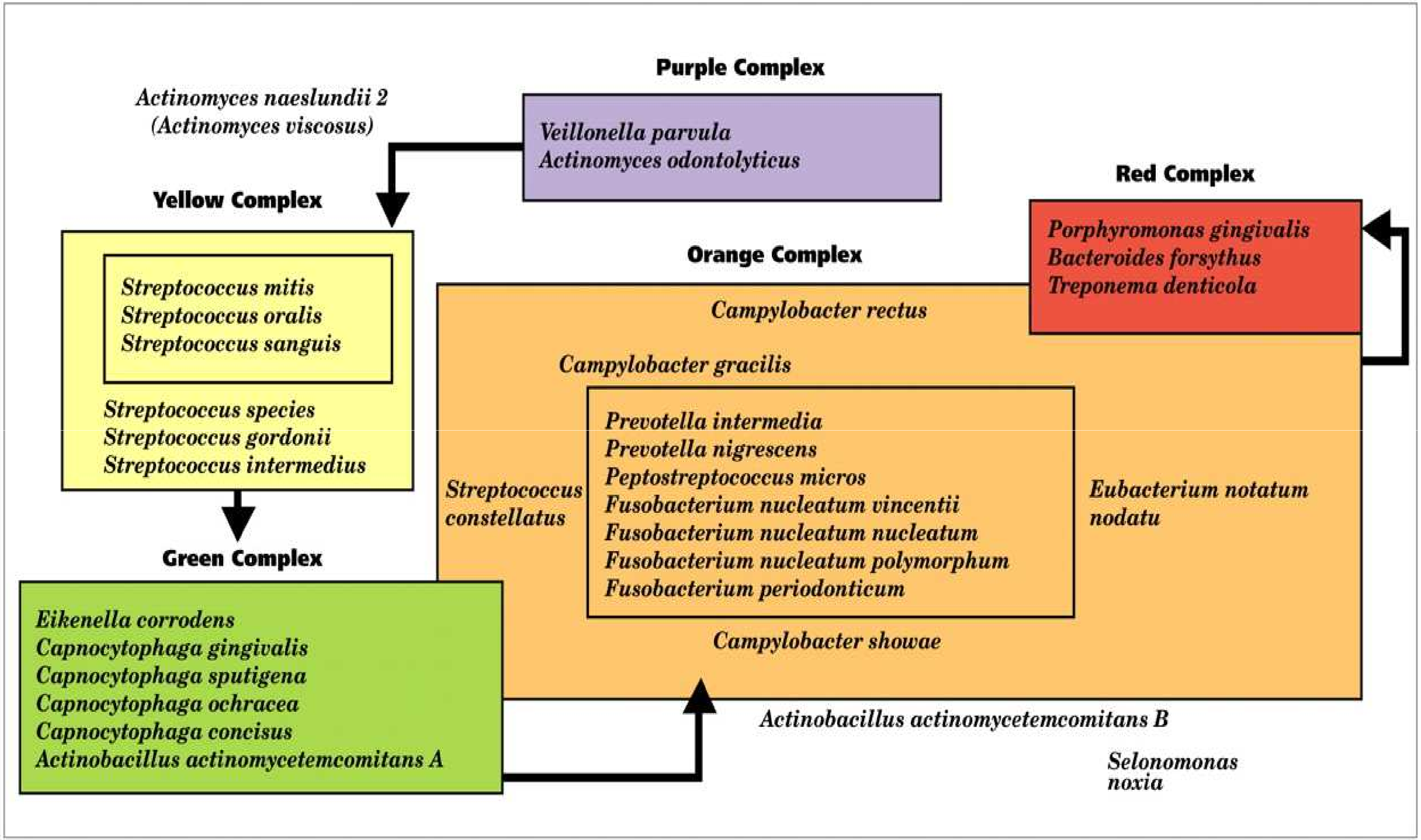


Infecção Necrosante


Heart Disease & Stroke
Diabetes & Obesity
PERIODONTAL DISEASE
Arthritis
Alzheimer's Disease
Cancer



Infecções/Inflamações crônicas e condições sistêmicas



Purple Complex
Actinomyces naeslundii 2
(Actinomyces viscosus)
Veillonella parvula
Actinomyces odontolyticus
Red Complex
Yellow Complex
Porphyromonas gingivalis
Bacteroides forsythus
Treponema denticola
Orange Complex
Streptococcus mitis
Streptococcus oralis
Streptococcus sanguis
Campylobacter rectus
Campylobacter gracilis
Streptococcus species
Streptococcus gordonii
Streptococcus intermedius
Prevotella intermedia
Prevotella nigrescens
Peptostreptococcus micros
Fusobacterium nucleatum vincentii
Fusobacterium nucleatum nucleatum
Fusobacterium nucleatum polymorphum
Fusobacterium periodonticum
Streptococcus constellatus
Eubacterium notatum nodatu
Green Complex
Eikenella corrodens
Capnocytophaga gingivalis
Capnocytophaga sputigena
Capnocytophaga ochracea
Capnocytophaga concisus
Actinobacillus actinomycetemcomitans A
Campylobacter showae
Actinobacillus actinomycetemcomitans B
Selonomonas noxia

Journal of Dentistry 48 (2016) 16–25

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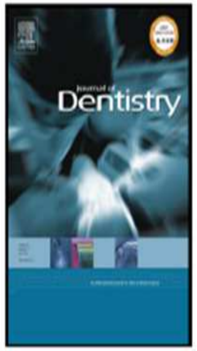


ELSEVIER

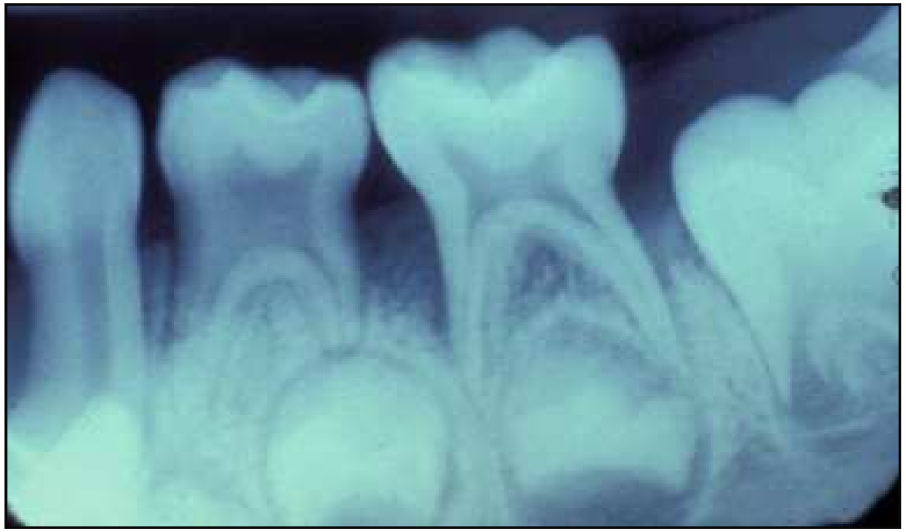
Review article

Probiotics for managing caries and periodontitis: Systematic review and meta-analysis

Deborah Gruner, Sebastian Paris, Falk Schwendicke*

Department of Operative and Preventive Dentistry, Charité–Universitätsmedizin Berlin, Germany, Aßmannshauser Str. 4-6, 14197 Berlin, Germany

- Sexo: Feminino
- Idade: 4 anos
- Perda óssea generalizada
- indicação/exodontia
- Pais e avós= parentes próximos



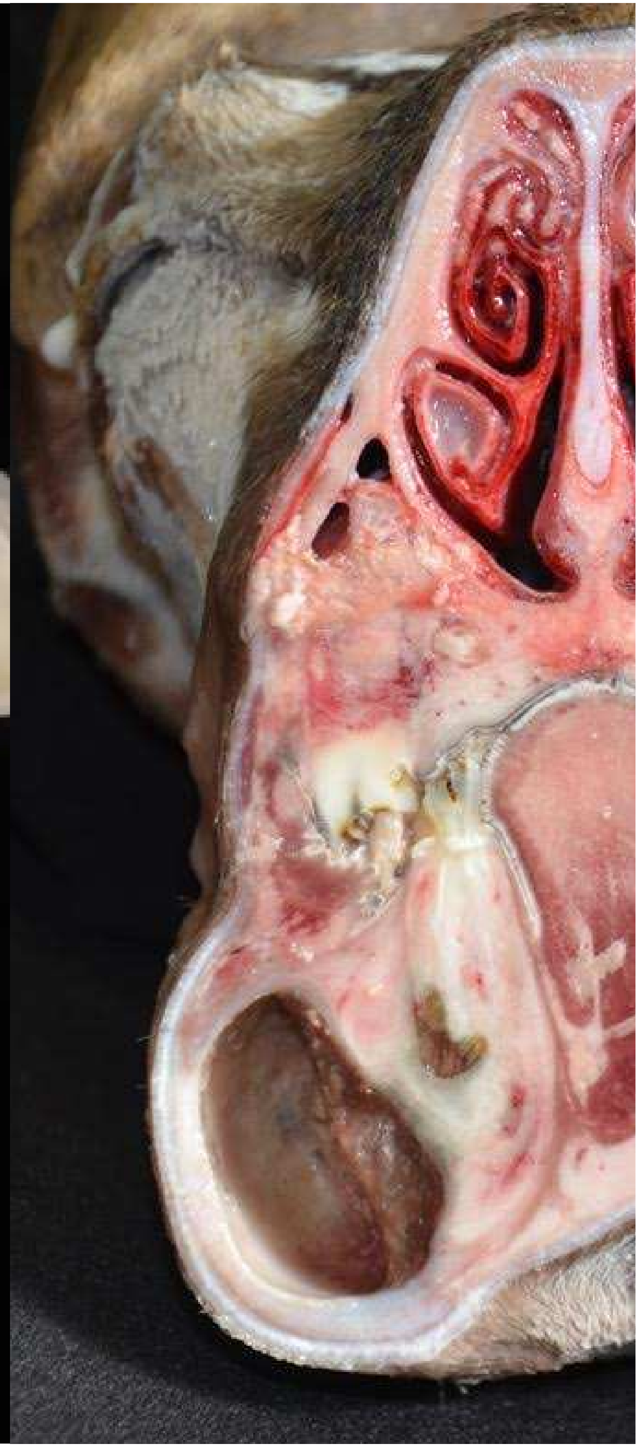



Table 1
Effects of challenge of murine atherosclerosis models with periodontal pathogens and their products.

Recipient mice	Pathogen	Findings	Reference
LDLR-deficient	*P. gingivalis*	Natural anti-MDA-LDL IgM recognizes epitopes of *P. gingivalis* gingipain. Immunization with *P. gingivalis* induced IgM, response to MDA-LDL, and decreased aortic lipid accumulation	Turunen et al. (2012)
LDLR-deficient	*P. gingivalis*	Immunization of *P. gingivalis*-challenged mice with MDA-LDL induced humoral immune response, IgM and IgG production, and led to diminished atherosclerosis	Turunen et al. (2015)
C57BL/6	*P. gingivalis*	*P. gingivalis* infection stimulates PCSK9 expression through activation of Srebf2 associated with degradation of LDLR and hypercholesterolemia	Miyazawa et al. (2012b)
ApoE-deficient	Immunization with peptides from *P. gingivalis* GroEL	Peptide 14 plays proatherogenic role (through induction of Th1 cells) while peptide 19 plays anti-atherogenic role (through induction of Tregs)	Jeong et al. (2015)
ApoE-deficient	*P. gingivalis* *F. nucleatum* *Treponema denticola* *Tannerella forsythia* (monoinfection and polyinfection)	*P. gingivalis* could access murine brain and induce complement activation and brain inflammation	Poole et al. (2015)
ApoE-deficient	*T. forsythia* or BspA (from *T. forsythia*)	*T. forsythia* or BspA causes accelerated atherosclerosis, foam cell formation, down-regulation of LXRα, LXRβ, and ABCA1, increase in serum CRP and LDL, decrease in serum HDL	Lee et al. (2014)
ApoE-deficient	GroEL from *F. nucleatum*	GroEL causes accelerated atherosclerosis, decrease in serum HDL, increase in serum CRP, IL-6, and LDL, foam cell formation, induction of proinflammatory (MCP-1, IL-8) and adhesion (ICAM-1, VCAM-1) in endothelial cells	Lee et al. (2012)
ApoE-deficient	*P. gingivalis*	*P. gingivalis* infection impairs vascular function through enhanced vasoconstriction and altered α-adrenoceptor-mediated vascular response	Pereira et al. (2011)
ApoE-deficient	*P. gingivalis* *T. denticola* *T. forsythia* (monoinfection and polyinfection)	Periodontal infection increased miR-146 associated with down-regulation of targets IRAK1 and TRAF6	Nahid et al. (2011)
ApoE-deficient	LPS from *P. gingivalis*	LPS increases atherosclerosis and stimulates TNF-α production by macrophages in COX2/PGE_2-dependent manner	Gitlin and Loftin, (2009)
ApoE-deficient	*A. actinomycetemcomitans*	*A. actinomycetemcomitans* infection causes hepatic infiltration by inflammatory cells, up-regulation of expression of proinflammatory genes, and increase in serum amyloid A	Hyvärinen et al. (2009)
ApoE- deficient	*P. gingivalis* 40-kDa OMP from *P. gingivalis*	*P. gingivalis* stimulates plaque development associated with elevated levels of inflammatory cytokines and induction of OMP-specific antibodies. Nasal immunization with 40-kDa OMP reduces plaque progression and levels of inflammatory markers	Koizumi et al. (2008)
ApoE-deficient	*A. actinomycetemcomitans*	Infection does not influences plaque size and progression but induces elevated CRP levels, atherogenic lipid profile (increased VLDL and LDL and decreased LDL), and increase in aortic MMP-9 expression	Tuomainen et al. (2008)
ApoE $^{+/-}$	*P. gingivalis*	Treatment of *P. gingivalis*-induced atherosclerosis with doxycycline results in reduction of plaque area, percentage of aromathous lesions, levels of proinflammatory cytokines, and MMP-9	Madan et al. (2007)
ApoE-deficient	*P. gingivalis*	Arg-gingipain from *P. gingivalis* specifically cleaves ApoB-100 inducing formation of foam cells, lipid accumulation, increase in LDL cholesterol, decrease in HDL cholesterol, and atherosclerosis progression	Hashimoto et al. (2006)
ApoE-deficient	*P. gingivalis*	*P. gingivalis* accelerates early atherosclerosis accompanied with increased macrophage infiltration, atheroma development, and stimulation of innate immunity but without up-regulation of systemic inflammation. This local proatherogenic inflammation could be prevented by *P. gingivalis* immunization	Miyamoto et al. (2006)
ApoE-deficient	*P. gingivalis*	*P. gingivalis* fimbriae-deficient mutant (FimA$^-$) cannot induce up-regulation of TLR2 and TLR4 and promote atherosclerosis	Gibson et al. (2004)
ApoE-deficient	*P. gingivalis*	*P. gingivalis* infection promotes early atherosclerosis through endothelial activation (increased expression of VCAM-1 and TF) and increased serum IL-6	Lalla et al. (2003)
ApoE-deficient	*P. gingivalis*	*P. gingivalis* increases lesion size, plaque macrophage accumulation; ribosomal DNA of the pathogen was found in the aorta, liver, and heart	Li et al. (2002)

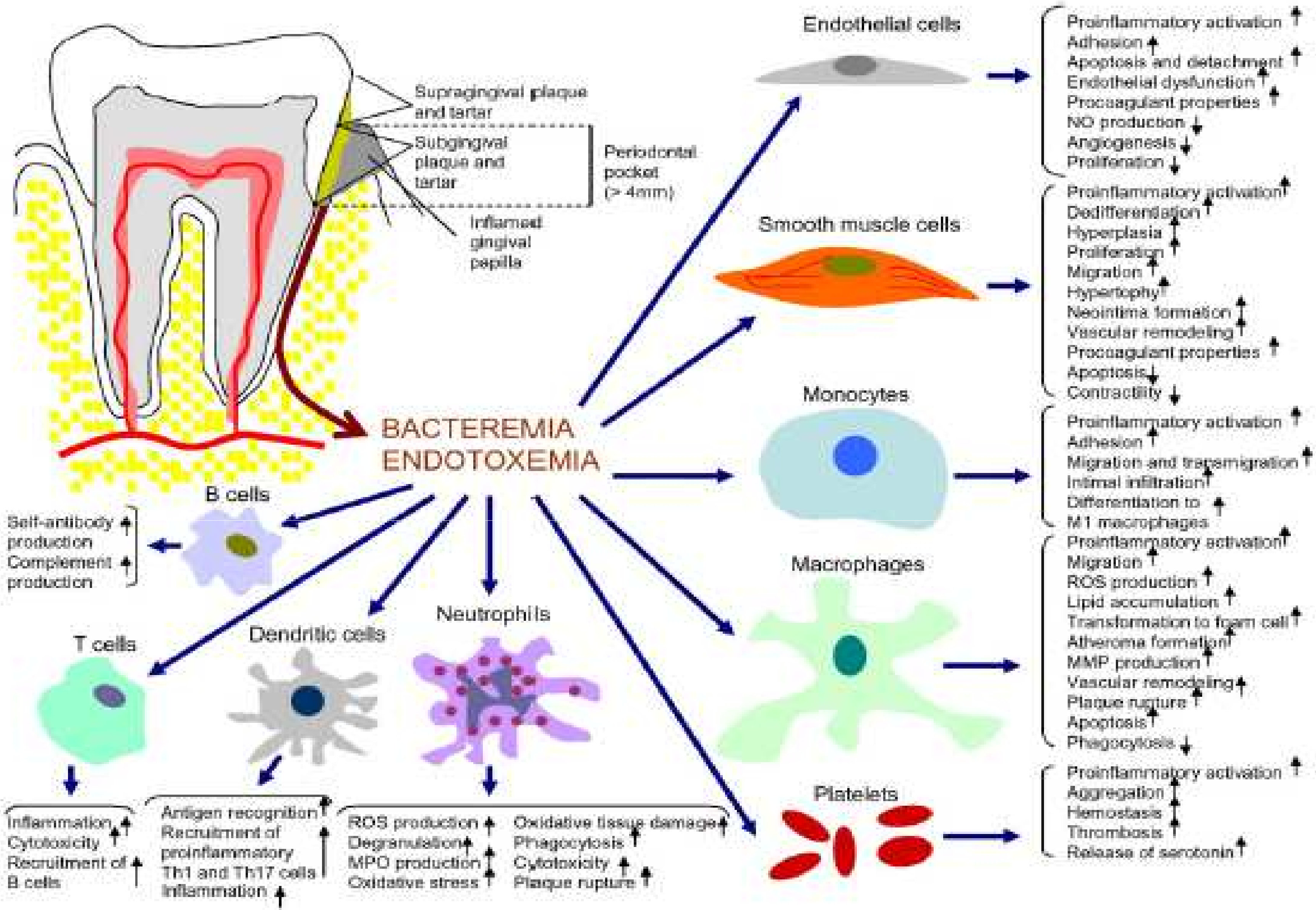
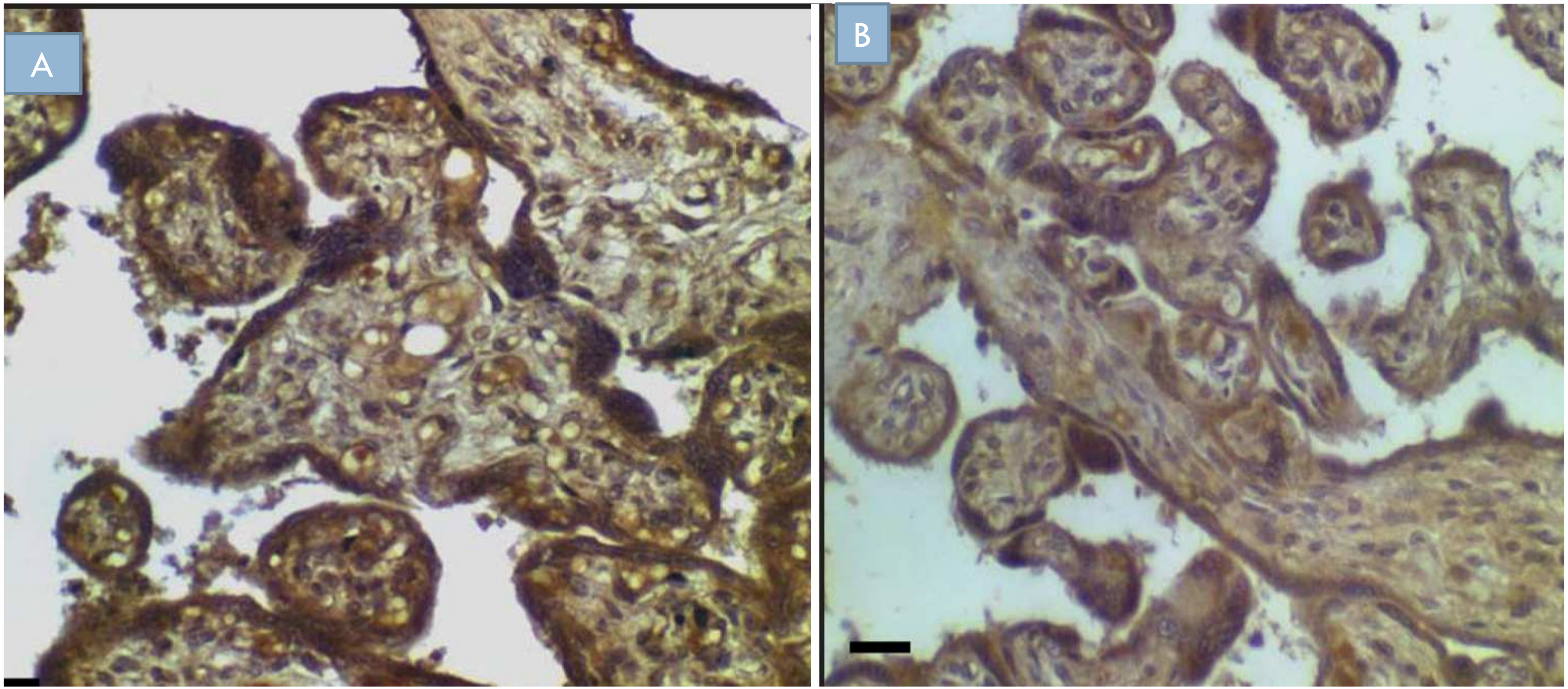


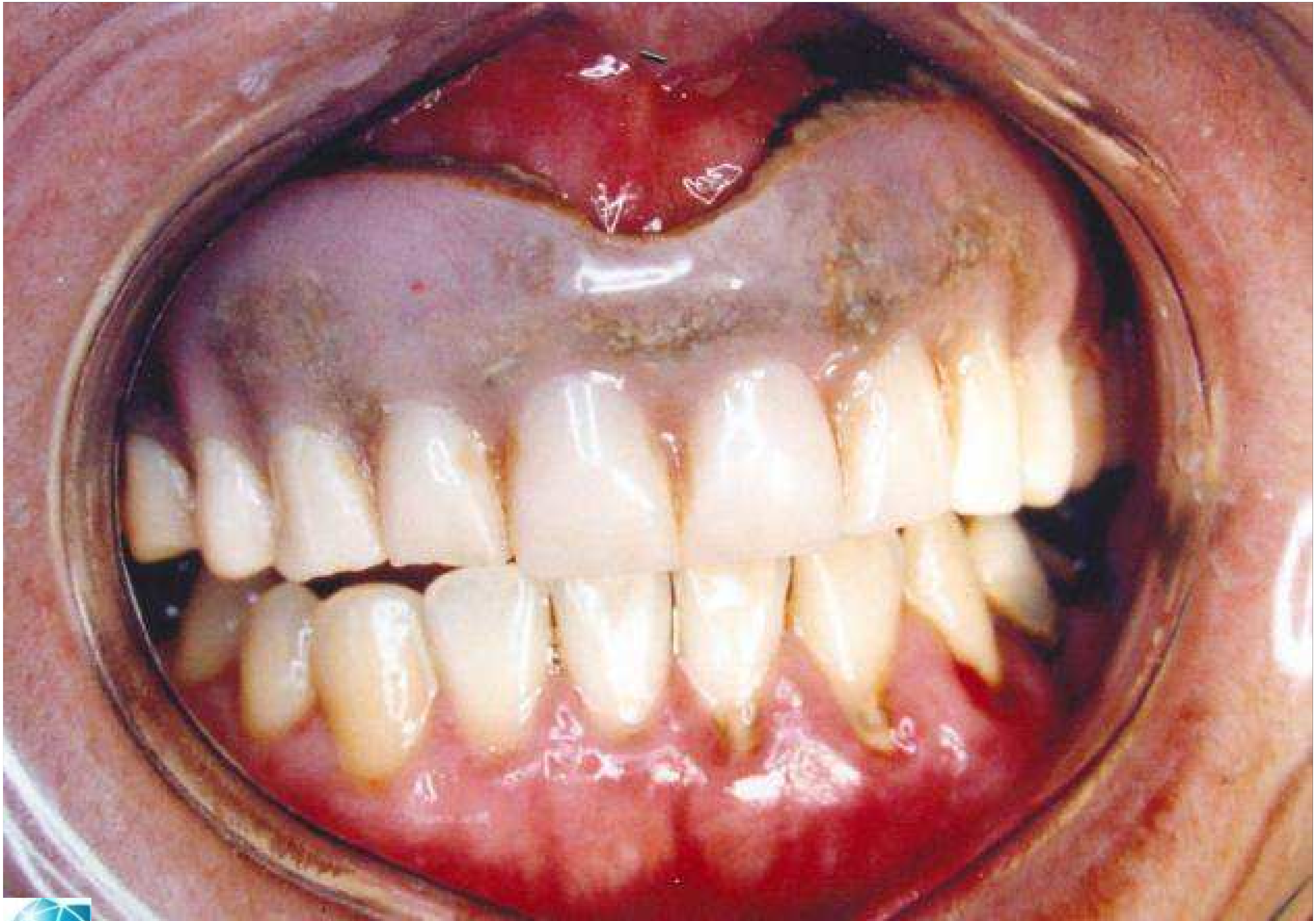
Fig. 1. Proatherogenic and proinflammatory effects of periodontal pathogens and their products on host vascular and blood-borne cells. Periodontitis progression leads to the destruction of surrounding gingival tissues and microvessels that opens a portal for disseminating periodontal bacteria (bacteremia) and their endotoxins (endotoxemia) in the circulation and option to influence atherogenesis.

Chistiakov et al., 2016

Antígenos de *P. gingivalis* na placenta de pacientes com coriomnionite (A) e pacientes controle



Katz et al., 2009

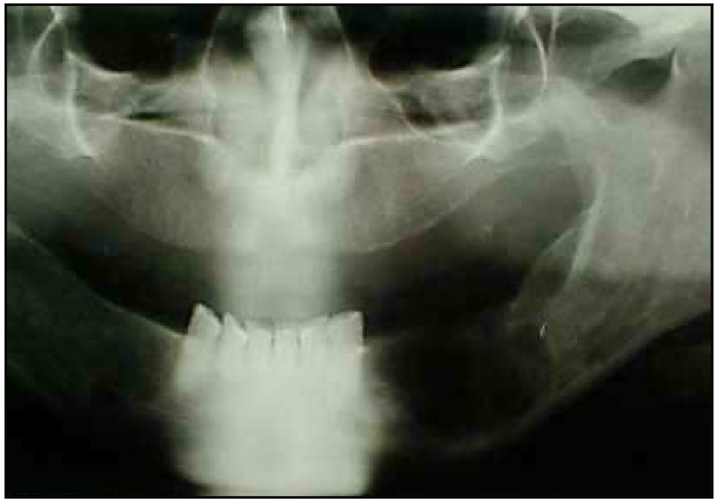


Lima de Castro et al., 2007

Lima de Castro et al., 2007

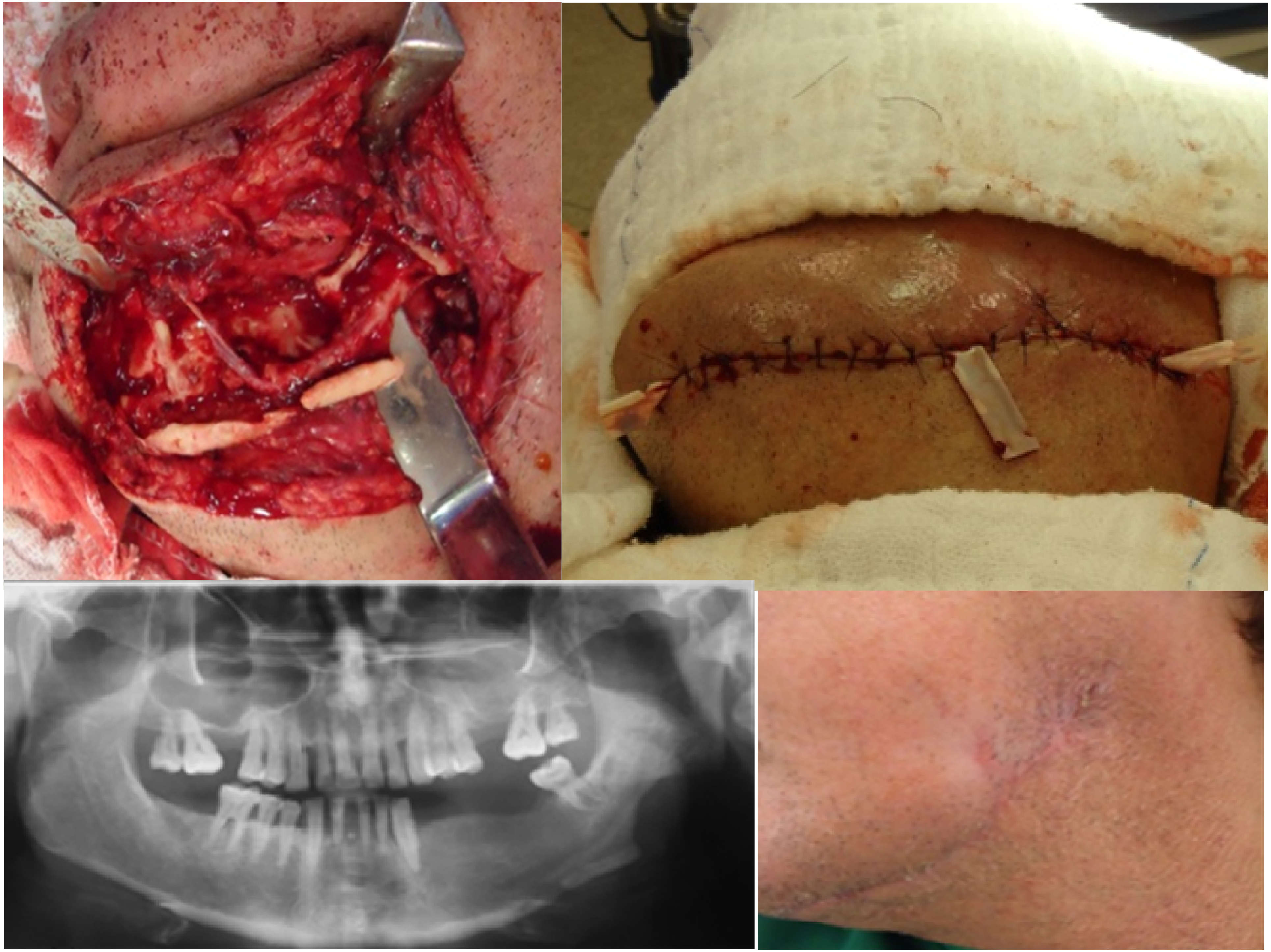
Lima de Castro et al., 2007

Osteomielites

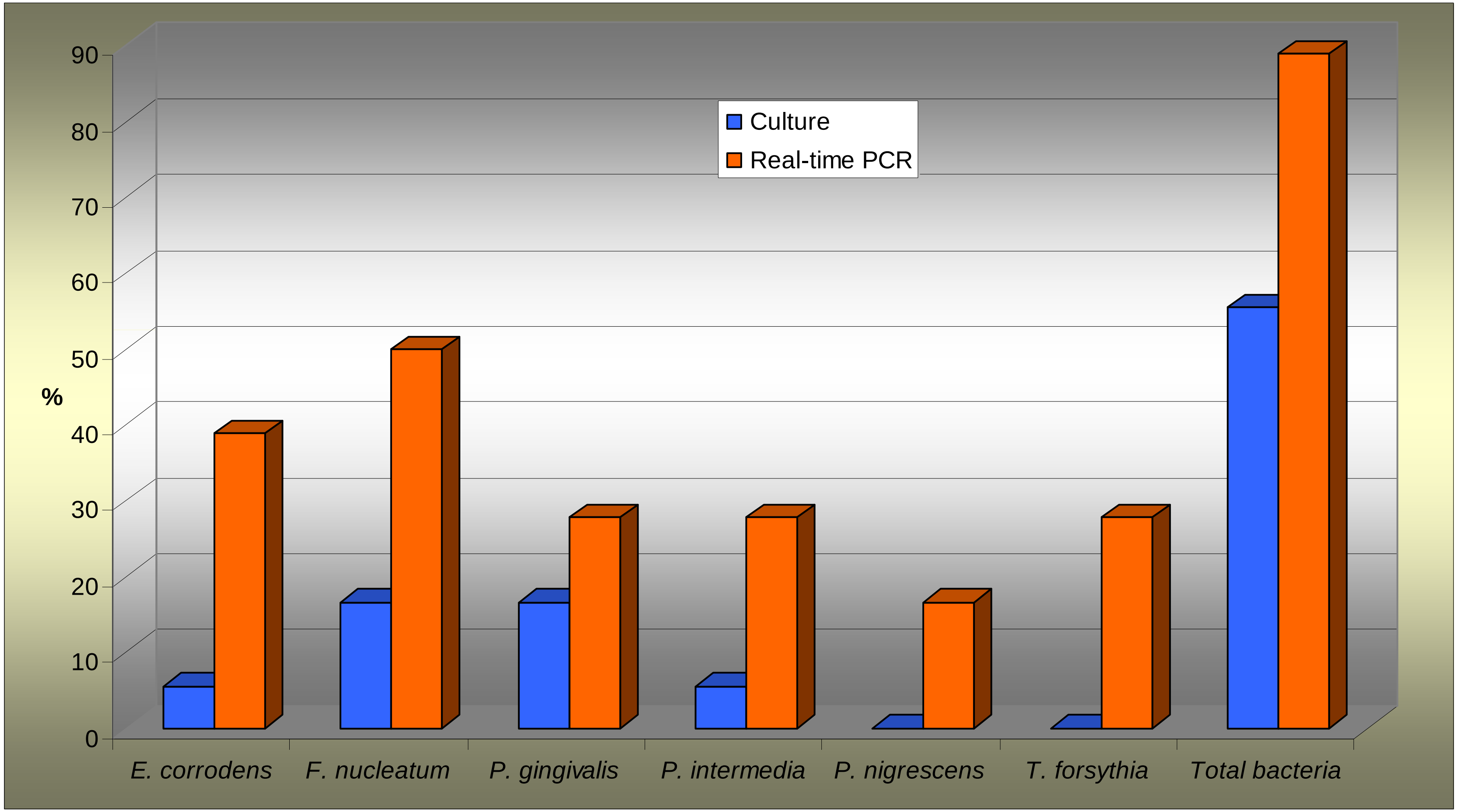


Microbiota residente de boca

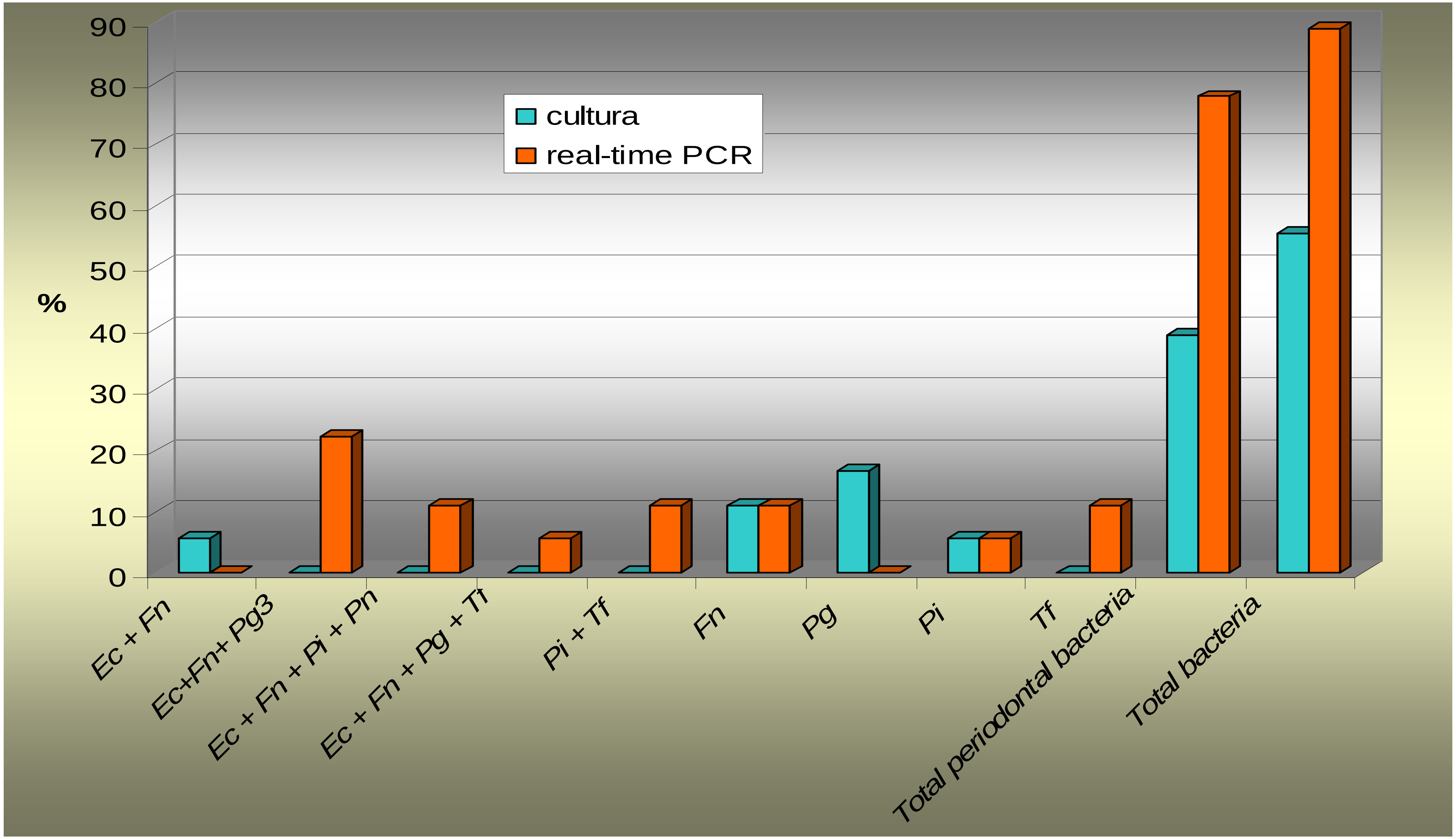

Osteomielite



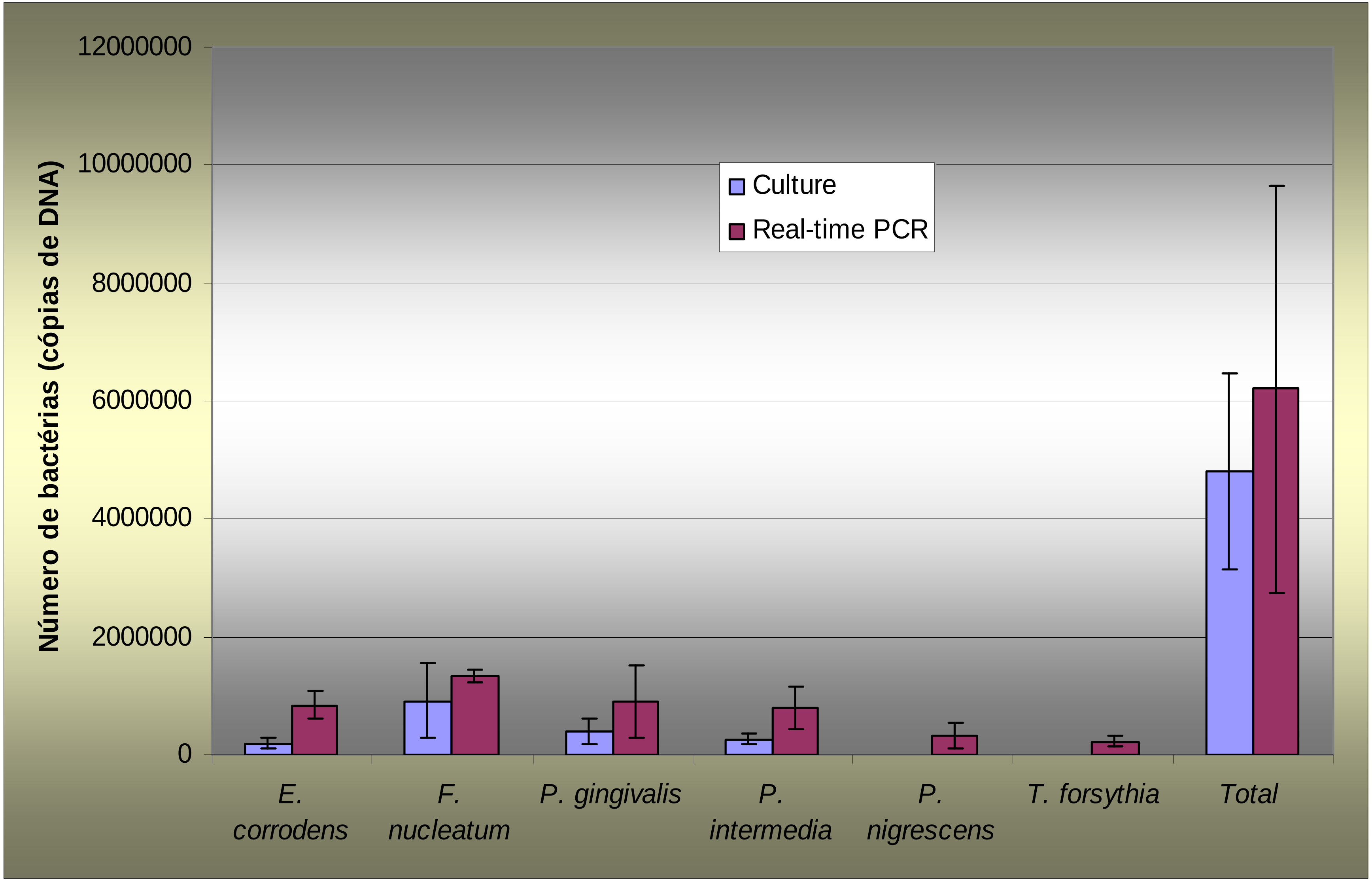
Ocorrência de periodontopatógenos em casos clínicos de osteomielite crônica dos maxilares



Associações microbianas em casos de osteomielite crônica



População de periodontopatógenos em casos clínicos de osteomielite crônica dos maxilares



- **Os microrganismos periodontais são responsáveis por mais de 60% do DNA microbiano observado nos processos infecciosos estudados**

- **Os gêneros *Fusobacterium* e *Eikenella* são os mais frequentes nesses processos infecciosos.**

⇨**Nome: CRM**

⇨**Idade: 47a**

⇨ **Local do atendimento: SCM ATA**

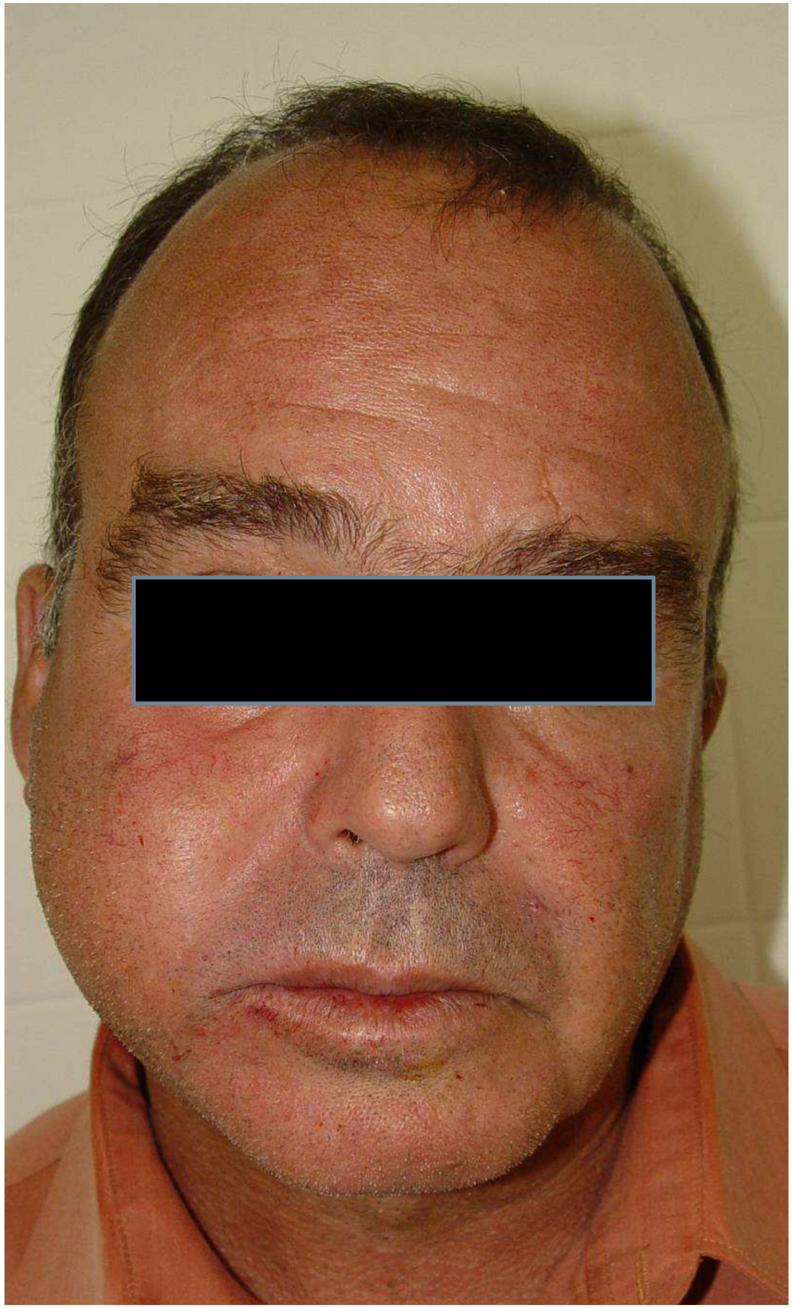
⇨ **História da doença atual: Paciente operado no dia 12/08/09**

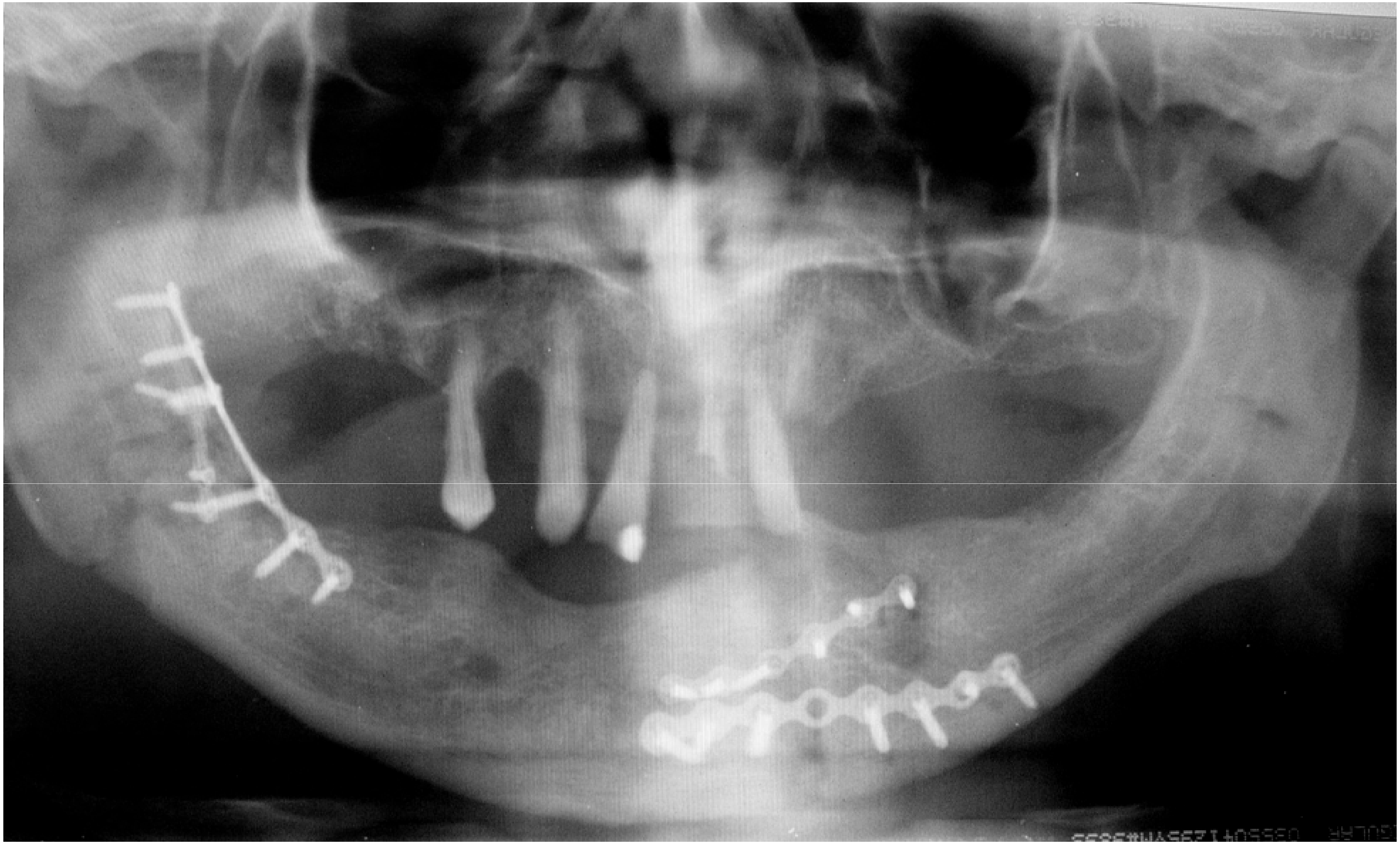
⇨**Diagnóstico: Infecção em região de material de fixação.**

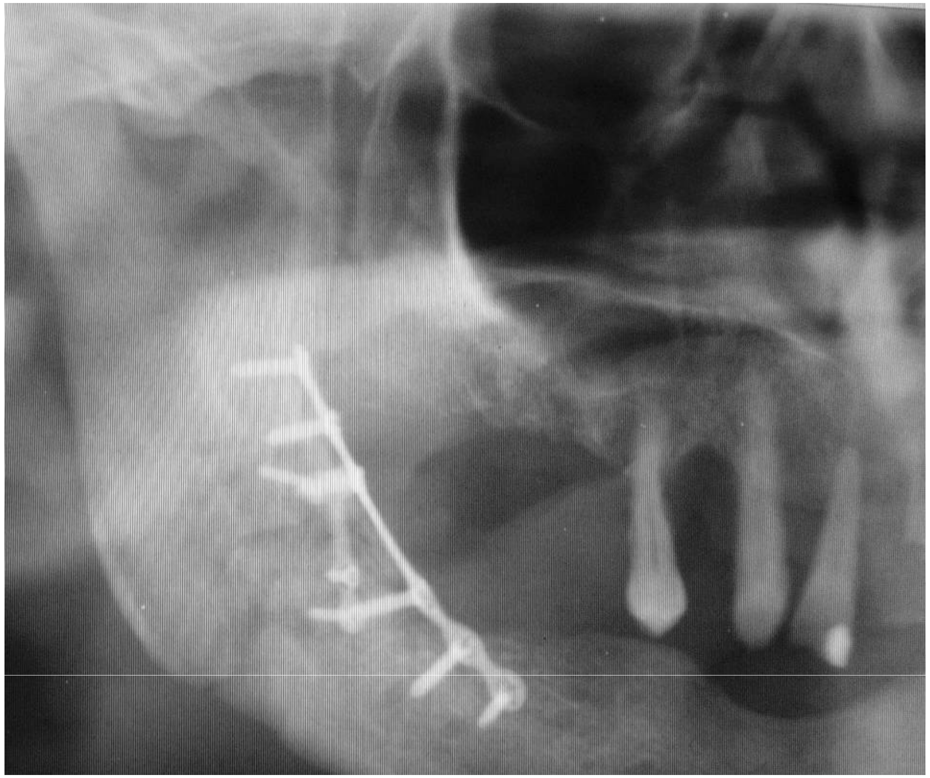
⇨**Conduta: - 23/11/09 – Avaliação clínica e radiográfica; prescrição medicamentosa;**

- 27/11/09 – Remoção das placas a nível ambulatorial;

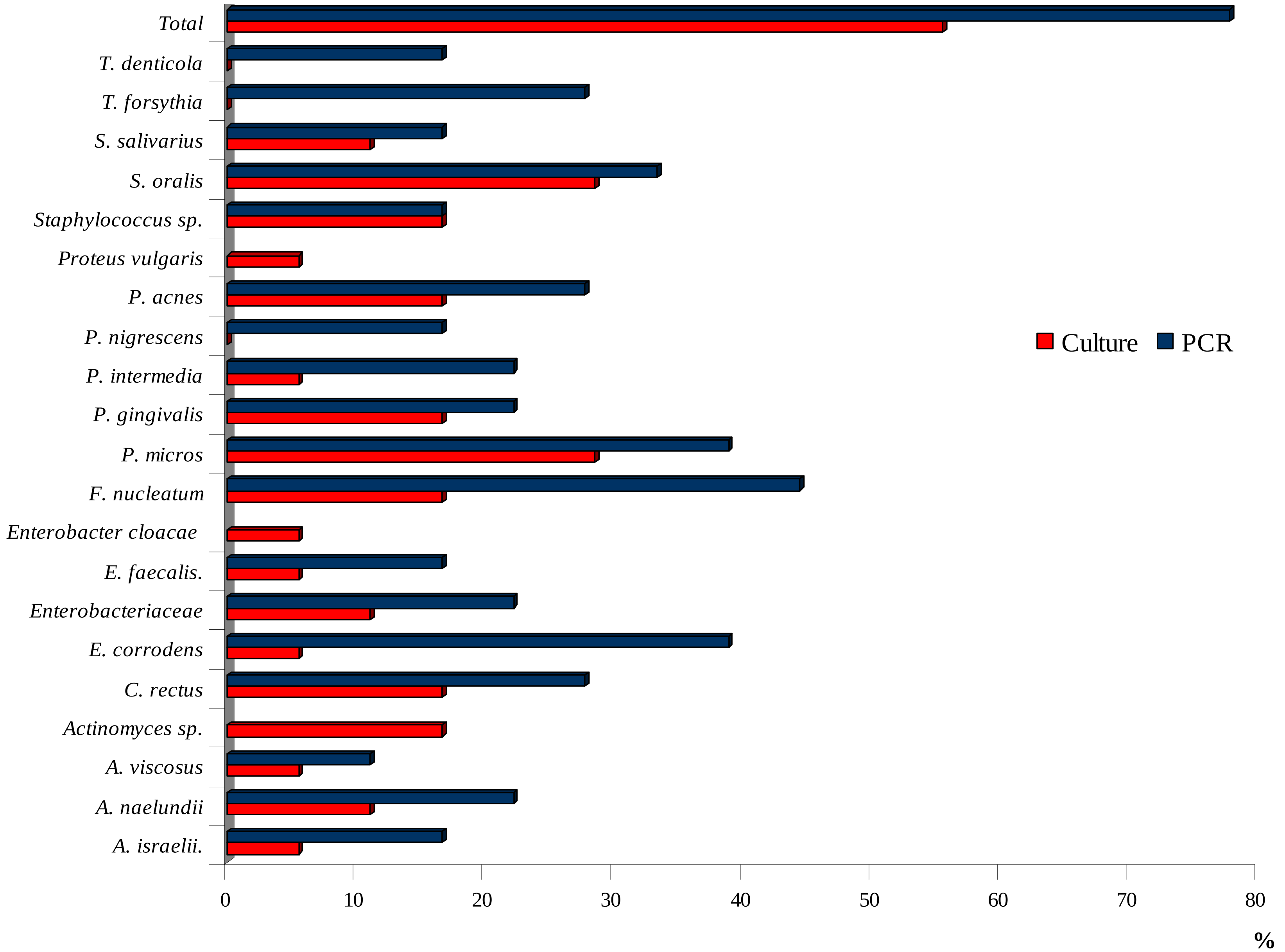
-27/11/09 – Alta ambulatorial. Agendamento de retorno



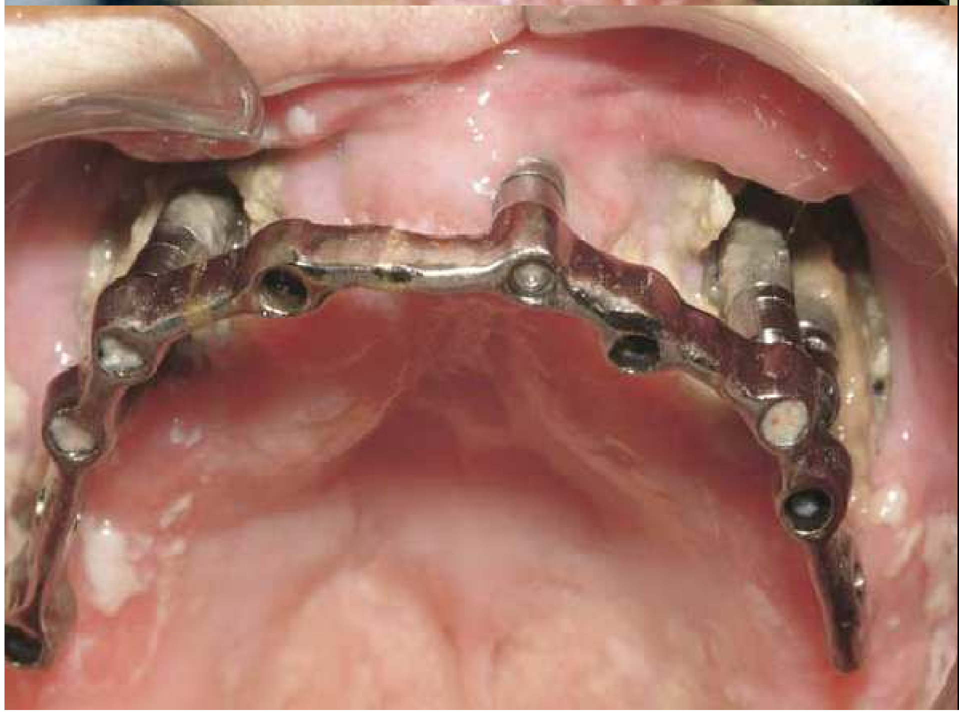




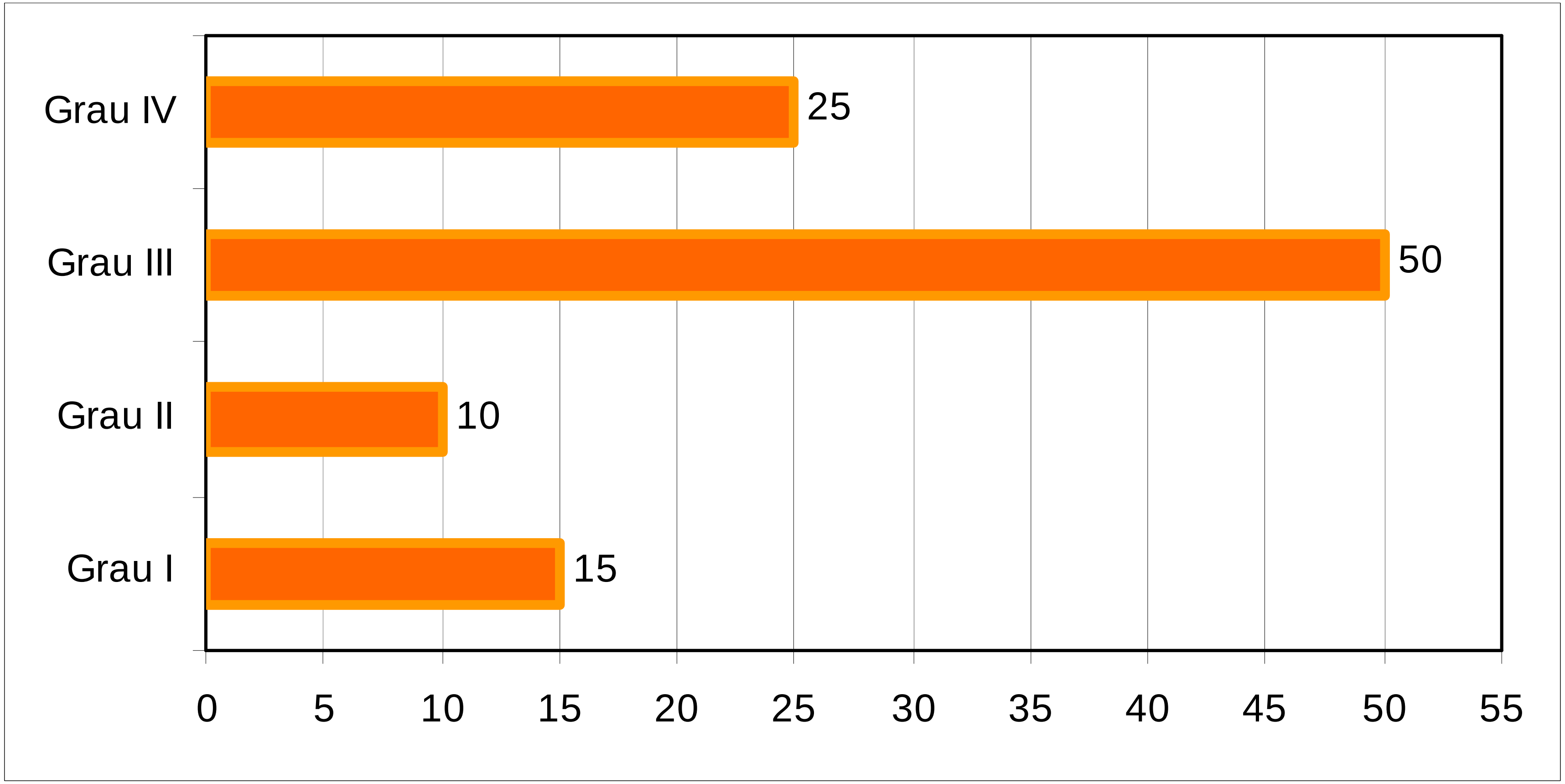
Microbiota de 22 casos de osteomielite crônica dos maxilares



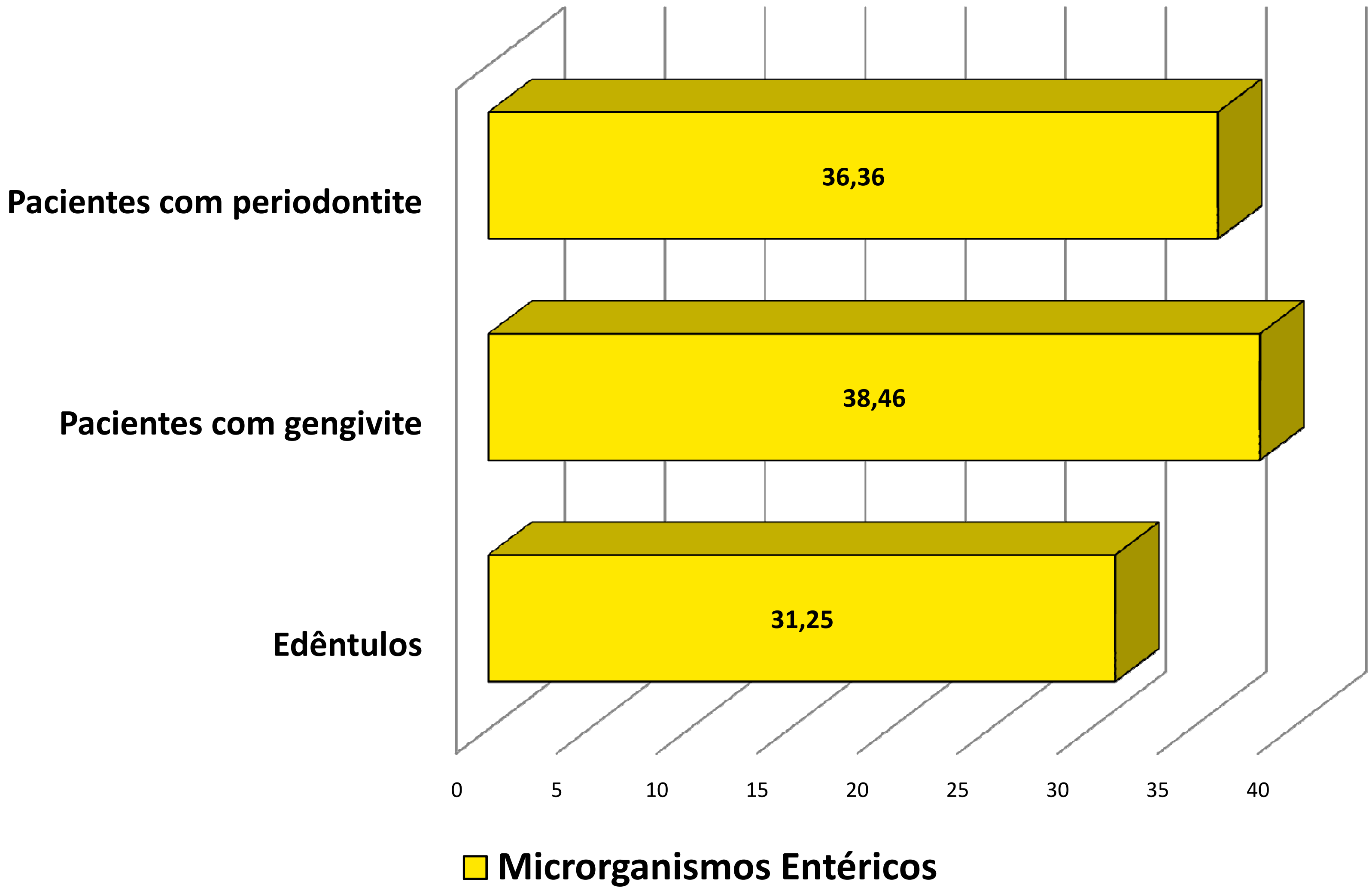




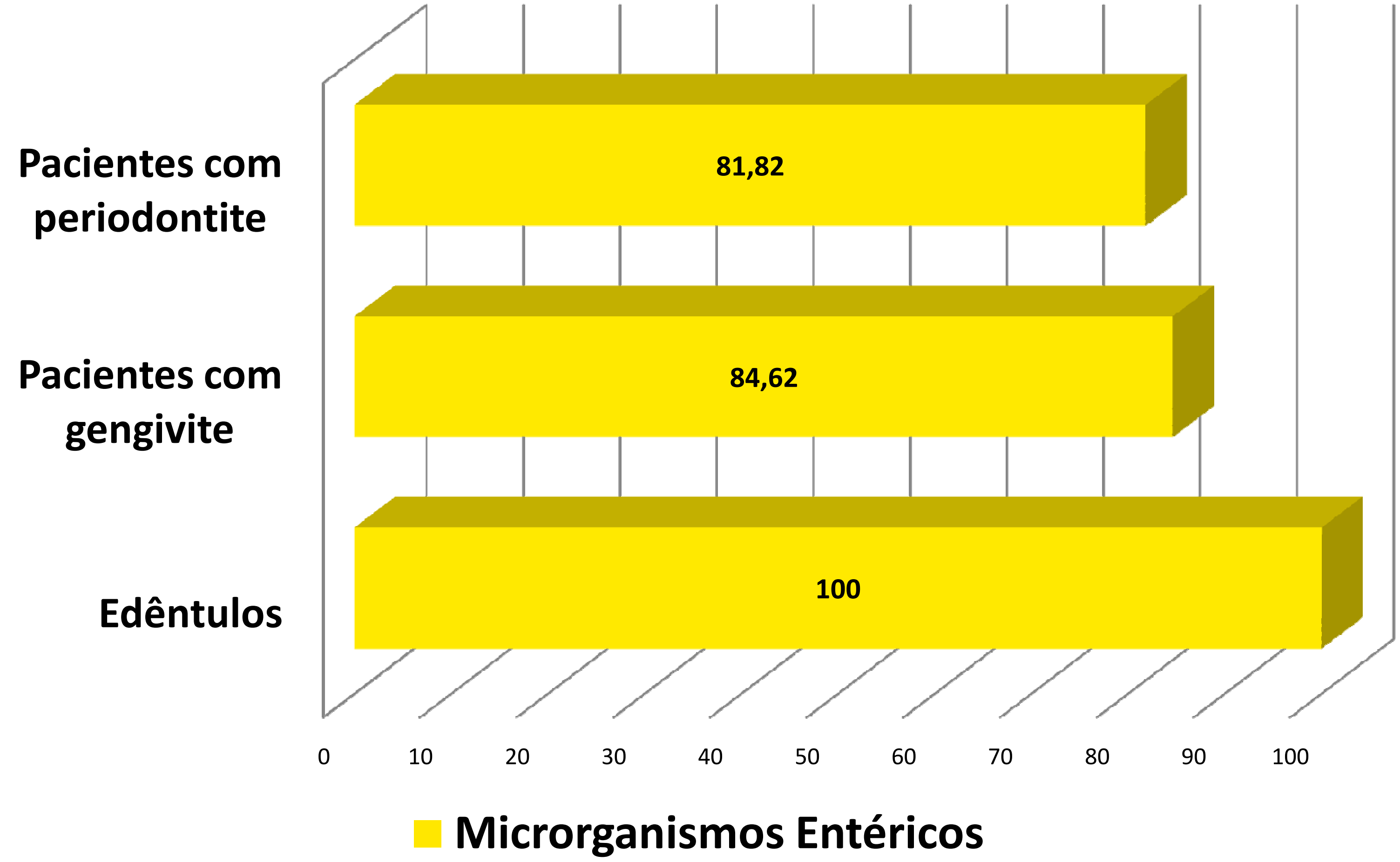

MUCOSITE – 30 DIAS APÓS RT



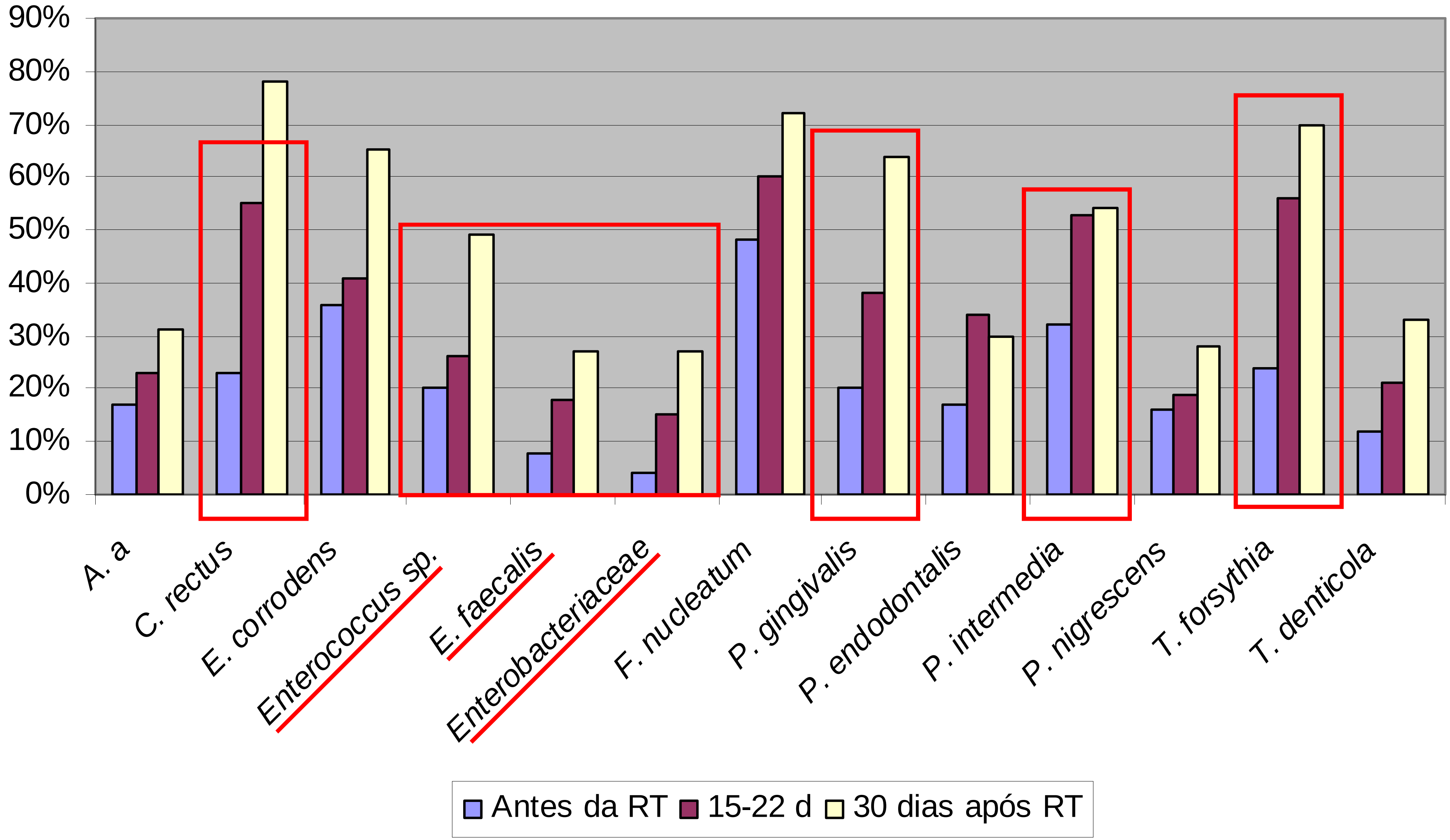
Antes da Radioterapia - PCR



30 dias após Radioterapia - PCR



Evolução dos pacientes



Candidose e Mucosite: interrupção

Osteorradionecrose: debilidade

Antimicrobial Resistance and Susceptibility Testing of Anaerobic Bacteria

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Table 2. Indications for Susceptibility Testing of Anaerobic Bacteria[a]

Indication	Examples
Persistence of infection despite adequate therapy with an appropriate therapeutic regimen	• Any anaerobe
Particular species of bacteria is implicated in disease	• *Bacteroides fragilis* • *Prevotella* species • *Clostridium* species other than *C. perfringens* • *Bilophila wadsworthia* • *Fusobacterium* species • *Sutterella wadsworthensis*
Long-term therapy needed	• Anaerobic organisms involved in osteomyelitis, endocarditis, or brain abscess
Pivotal role of antimicrobial agent in clinical outcome	• *B. fragilis* group implicated in osteomyelitis or joint infection
Infections of specific body sites	• Brain abscess • Endocarditis • Prosthetic devices or graft infections • Bacteremia

Table 3. Suggested Antimicrobial Agents for Testing and Reporting on Anaerobic Organisms[a]

Antimicrobials for Primary Testing and Reporting	
Bacteroides fragilis Group and Other Gram-Negative Anaerobes	Gram-Positive Anaerobes
	Ampicillin Penicillin
Amoxicillin-clavulanate	Amoxicillin-clavulanate
Ampicillin-sulbactam	Ampicillin-sulbactam
Piperacillin-tazobactam	Piperacillin-tazobactam
Ticarcillin-clavulanate	Ticarcillin-clavulanate
Clindamycin	Clindamycin
Doripenem	Doripenem
Ertapenem	Ertapenem
Imipenem	Imipenem
Meropenem	Meropenem
Metronidazole	Metronidazole

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Clinical microbiology

Antimicrobial susceptibility of clinical isolates of anaerobic bacteria in Ontario, 2010–2011

Alex Marchand-Austin [a, b], Prasad Rawte [a], Baldwin Toye [c], Frances B. Jamieson [a, b], David J. Farrell [a, b], Samir N. Patel [a, b, *]

Table 2 (*continued*)

Organisms and antimicrobial agent	No. of isolates	MIC Range	MIC 50%	MIC 90%	% Resistant
***Fusobacterium* spp.**	**149**				
Cefoxitin	33	≤0.015–>256	0.03	32	9.1
Clindamycin	33	≤0.015–8	0.03	1	6.1
Meropenem	8	≤0.002–2	0.03	2	0
Metronidazole	33	≤0.015–0.25	0.03	0.12	0
Penicillin	33	≤0.002–>32	0.0075	0.5	12.1
Piperacillin-tazobactam	8	0.00375–1	0.015	1	0
Gram-positive cocci[a]	**171**				
Cefoxitin	104	≤0.015–8	0.25	4	0
Clindamycin	104	0.015–>256	0.12	16	13.5
Meropenem	44	≤0.002–0.12	0.0075	0.12	0
Metronidazole	104	0.03–>256	0.5	>256	28.8
Penicillin	104	≤0.002–>32	0.06	0.25	1.9
Piperacillin-tazobactam	44	≤0.015/4–0.5	0.0075	0.25	0

Table 2 (*continued*)

Organisms and antimicrobial agent	No. of isolates	MIC			% Resistant
		Range	50%	90%	
Parvimonas micra	**68**				
Cefoxitin	41	≤0.015–2	0.25	1	0
Clindamycin	41	≤0.015–16	0.25	1	7.3
Meropenem	14	0.004–0.12	0.015	0.12	0
Metronidazole	41	≤0.015–0.25	0.03	0.12	0
Penicillin	40	≤0.002–0.12	0.0075	0.03	0
Piperacillin-tazobactam	14	≤0.015/4–0.015	0.00375	0.015	0
***Prevotella* spp.**	**100**				
Cefoxitin	60	≤0.015–16	0.5	4	0
Clindamycin	61	≤0.015–>256	0.03	>256	37.7
Meropenem	16	≤0.002–0.12	0.03	0.12	0
Metronidazole	60	≤0.015–4	0.25	1	0
Penicillin	60	0.004–>32	4	>32	65
Piperacillin-tazobactam	15	≤0.015/4–0.25	<0.015/4	0.03	0

Table 4
The range, MIC_{50} and MIC_{90} of clindamycin and metronidazole for anaerobic bacteria isolated in The Netherlands, compared to susceptibility data from other countries in Europe.

Strains	The Netherlands (this study)		Belgium 2011–2012 [17]		Belgium 2005–2007 [18]		Bulgaria 1983–2007 [19]		France 2000 [11]		Greece 2006–2007 [20]	
	Range	MIC_{50}/MIC_{90}	Range	MIC_{50}/MIC_{90}	Range	MIC_{50}/MIC_{90}	Range	MIC_{50}/MIC_{90}	Range	MIC_{50}/MIC_{90}	Range	MIC_{50}/MIC_{90}
B. fragilis group spp.												
Clindamycin	<0.016–>256	1.5/>256	0.032–>256	1/>256	<0.016–256	3/>256	0.125–32	0.5/4	≤0.06–>256	1/>256	0.016–>256	1/>256
Metronidazole	<0.016–1.5	0.38/0.75	0.125–2	0.25/0.5	<0.016–6	0.5/0.75	0.25–2	0.5/1	0.125–64	1/4	0.032–>32	0.5/1
GPAC												
Clindamycin	<0.016–>256	0.19/8	<0.016–>256	0.25/>256	<0.016–≥256	0.25/>256	≤0.125–16[a]	0.25/2				
Metronidazole	<0.016–2	0.125/0.5	<0.016–>256	0.25/1	0.016–2	0.19/0.75	≤0.125–32[a]	0.5/16				
Prevotella spp.												
Clindamycin	<0.016–>256	0.016/32	<0.016–>256[b]	0.032/>256	<0.016–≥256[b]	0.032/>256	≤0.125–0.25	0.125/0.25	≤0.06–>256	0.125/0.5	0.016–>256	0.064/>256
Metronidazole	<0.016–24	0.19/0.75	<0.016–>256[b]	0.25/2	<0.016–6[b]	0.25/1	0.125–4	0.5/2	≤0.06–8	1/4	0.016–>32	0.25/2
Clostridium spp.												
Clindamycin	0.016–>256	0.75/>256	<0.016–>256	0.5/32	0.016–≥256	1/>256	≤0.125–>32[c]	0.5/16				
Metronidazole	<0.016–4	0.38/1.5	<0.016–4	0.25/2	0.016–4	0.38/3	≤0.125–8[c]	0.5/1				
Fusobacterium spp.												
Clindamycin	<0.016–0.75	0.094/0.19	<0.016–>256	0.064/16	<0.016–≥256	0.023/1	≤0.125–2	0.25/1	≤0.06–4	<0.06/1		
Metronidazole	<0.016–0.25	<0.016/0.094	<0.016–0.25	0.064/0.125	<0.016–1	0.032/0.38	≤0.125–2	0.5/1	≤0.06–4	0.125/2		

[a] *Peptostreptococcus* spp. were excluded.
[b] Besides the *Prevotella* strains, other Gram-negative rods were also included.
[c] *Clostridium perfringens* was excluded.

Veloo & van Winkelhoff, 2015

Table 1
Susceptibility of anaerobic isolates to 9 antimicrobial agents.

Isolate (number tested) and antibiotics	% MIC[a] (μg/ml)					
	S	I	R	Range	MIC_{50}[b]	MIC_{90}[b]
Bacteroides spp. (35)						
Penicillin	2.9	0	97.1	0.25->32	>32	>32
Amoxicillin/clavulanic acid	85.7	8.6	5.7	0.032->256	1.0	8.0
Piperacillin/tazobactam	80.0	11.4	8.6	0.032–32.0	1.0	16.0
Clindamycin	71.0	0	29.0	<0.032->256	2.0	>256
Imipenem	94.3	2.85	2.85	0.032->32	0.5	4.0
Meropenem	94.3	5.7	0	0.032–8.0	0.064	0.25
Ertapenem	94.3	0	5.7	0.032–4.0	0.125	1.0
Metronidazole	97.1	0	2.9	0.032->256	0.5	2.0
Other Gram negative bacilli (25)						
Penicillin	24.0	0	76.0	0.003->32	>32	>32
Amoxicillin/clavulanic acid	92.0	0	8.0	0.032->256	0.25	1.0
Piperacillin/tazobactam	88.0	0	12.0	<0.032->256	0.125	>256
Clindamycin	72.0	0	28.0	<0.032->256	1.0	>256
Imipenem	96.0	4.0	0	0.064–4.0	1.0	1.0
Meropenem	100	0	0	0.032–0.5	0.125	0.5
Ertapenem	100	0	0	0.032–0.5	0.125	0.5
Metronidazole	92.0	0	8.0	0.064->256	0.25	4.0
Gram positive cocci (14)						
Penicillin	100	0	0	0.032–0.064		
Amoxicillin/clavulanic acid	100	0	0	<0.016–0.032		
Piperacillin/tazobactam	100	0	0	<0.016–0.125		
Clindamycin	100	0	0	0.064		
Imipenem	100	0	0	0.064–0.25		
Meropenem	100	0	0	0.016		
Ertapenem	100	0	0	0.016		
Metronidazole	71.4	0	28.6	0.25->256		
Vancomycin	100	0	0	0.25–0.38		

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Diagnostic Microbiology and Infectious Disease

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Epidemiology and antimicrobial susceptibilities of wound isolates of obligate anaerobes from combat casualties☆

Brian K. White [a,*], Katrin Mende [a,b,c], Amy C. Weintrob [b,c,d,1], Miriam L. Beckius [a], Wendy C. Zera [a,b,c], Dan Lu [b,c], William Bradley [a,b,c], David R. Tribble [b], Elizabeth R. Schnaubelt [e], Clinton K. Murray [a], on behalf of the Infectious Disease Clinical Research Program Trauma Infectious Disease Outcome Study Group

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Prevotella spp. (n = 11)	MIC_{50}	MIC_{90}	MIC Range	Susceptible (%)
Ampicillin-sulbactam	<4/2	16/8	<4/2–16/8	8 (73%)
Piperacillin-tazobactam	<16/4	<16/4	<16/4	11 (100%)
Cefoxitin	<8	32	<8–64	9 (82%)
Clindamycin	<1	>16	<1–>16	7 (64%)
Ertapenem	2	4	<1–4	11 (100%)
Imipenem	<2	<2	<2	11 (100%)
Meropenem	<2	8	<2–8	9 (82%)
Metronidazole	<4	<4	<4–>64	10 (91%)
Moxifloxacin	2	4	<1–8	8 (73%)
Tigecycline	<2	8	<2–8	9 (82%)
Linezolid	<0.5	<0.5	<0.5	N/A

Beta-lactamic Resistance Profiles in *Porphyromonas*, *Prevotella*, and *Parvimonas* Species Isolated from Acute Endodontic Infections

Francisco Montagner, DDS, MSc, PhD,[*] *Rogério Castilho Jacinto, DDS, MSc, PhD,*[†]
Fernanda Graziela Correa Signoretti, DDS, MSc, PhD,[‡]
Vanessa Scheffer de Mattos, DDS,[*] *Fabiana Soares Grecca, DDS, MSc, PhD,*[*]
and Brenda Paula Figueiredo de Almeida Gomes, DDS, MSc, PhD[‡]

Abstract

Introduction: Susceptibility to beta-lactamic agents has changed among anaerobic isolates from acute

best describe additional mechanisms involved in lactamic resistance for strict anaerobes. *(J Endod 2014;40:339–344)*

TABLE 2. Susceptibility Profile, Presence of the *cfxA/cfxA2* Gene, and Nitrocefin Test of Strains Isolated from Root Canals in Acute Endodontic Infections

		Benzylpenicillin		Amoxicillin		Amox + Clavulanate		*cfxA/cfxA2*	Nitrocefin
Species	Strain	MIC	Profile	MIC	Profile	MIC	Profile	Gene	Test
P. buccae	Pb1	0.19	S	3	S	0.5	S	–	+
	Pb2	0.08	S	0.94	S	0.94	S	–	–
	Pb3	1	R	0.19	S	0.23	S	–	–
	Pb4	0.023	S	0.016	S	0.125	S	–	–
	Pb5	0.047	S	0.016	S	0.032	S	–	–
	Pb6	0.094	S	0.125	S	0.125	S	+	+
	Pb7	0.032	S	0.032	S	0.064	S	–	–
	Pb8	48	R	4	R	3	R	–	–
P. disiens	Pd1	0.008	S	0.016	S	0.016	S	–	–
	Pd2	0.016	S	0.016	S	0.016	S	–	–
P. oralis	Po1	0.016	S	0.016	S	0.016	S	–	–
	Po2	0.002	S	0.016	S	0.016	S	–	–
	Po3	0.016	S	0.016	S	0.016	S	–	+
P. int./nigr.	Pi/n1	0.016	S	0.016	S	0.016	S	–	–
	Pi/n2	256	R	1.5	S	0.25	S	–	–
	Pi/n3	0.016	S	0.016	S	0.023	S	–	–
	Pi/n4	0.002	S	0.016	S	0.016	S	–	–
	Pi/n5	0.016	S	0.016	S	0.016	S	–	–
P. endodontalis	Pe1	24	R	6	R	4	R	–	–
P. gingivalis	Pg1	0.016	S	0.016	S	0.016	S	–	–
P. micra	Pm1	0.002	S	0.016	S	0.032	S	–	–
	Pm2	0.016	S	0.016	S	0.023	S	–	–
	Pm3	0.064	S	0.016	S	0.023	S	–	+
	Pm4	0.016	S	0.64	S	0.094	S	+	–
	Pm5	0.016	S	0.016	S	0.032	S	–	–
	Pm6	0.002	S	0.016	S	0.016	S	–	–
	Pm7	0.006	S	0.016	S	0.023	S	–	–
	Pm8	0.016	S	0.032	S	0.016	S	–	–
	Pm9	0.016	S	0.016	S	0.016	S	–	–

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Oral Gram-negative anaerobic bacilli as a reservoir of β-lactam resistance genes facilitating infections with multiresistant bacteria

Clarisse Dupin[a,1], Zohreh Tamanai-Shacoori[b,1], Elodie Ehrmann[c,d], Anais Dupont[b], Frédérique Barloy-Hubler[e], Latifa Bousarghin[b], Martine Bonnaure-Mallet[a,b], Anne Jolivet-Gougeon[a,b,*]

Table 1
β-Lactamases in Gram-negative oral bacteria. The sequ
[41].

Enzyme	Class	Bacterial species
CblA	A/2e	*Bacteroides uniformis*
CepA	A/2e	*Bacteroides fragilis*
CfiA	B/3	*Bacteroides fragilis*
CSP-1	A	*Capnocytophaga sputigena*
TEM17	A	*Capnocytophaga ochracea*
FUS-1	D	*Fusobacterium nucleatum*
CfxA	A/2e	*Bacteroides distasonis*
CfxA	A/2e	*B. fragilis, B. vulgatus*
CfxA2	A/2e	*Prevotella, Capnocytophaga* spp.
CfxA3	A/2e	*Capnocytophaga* spp.
PEN-Y	A/2a	*Fusobacterium*

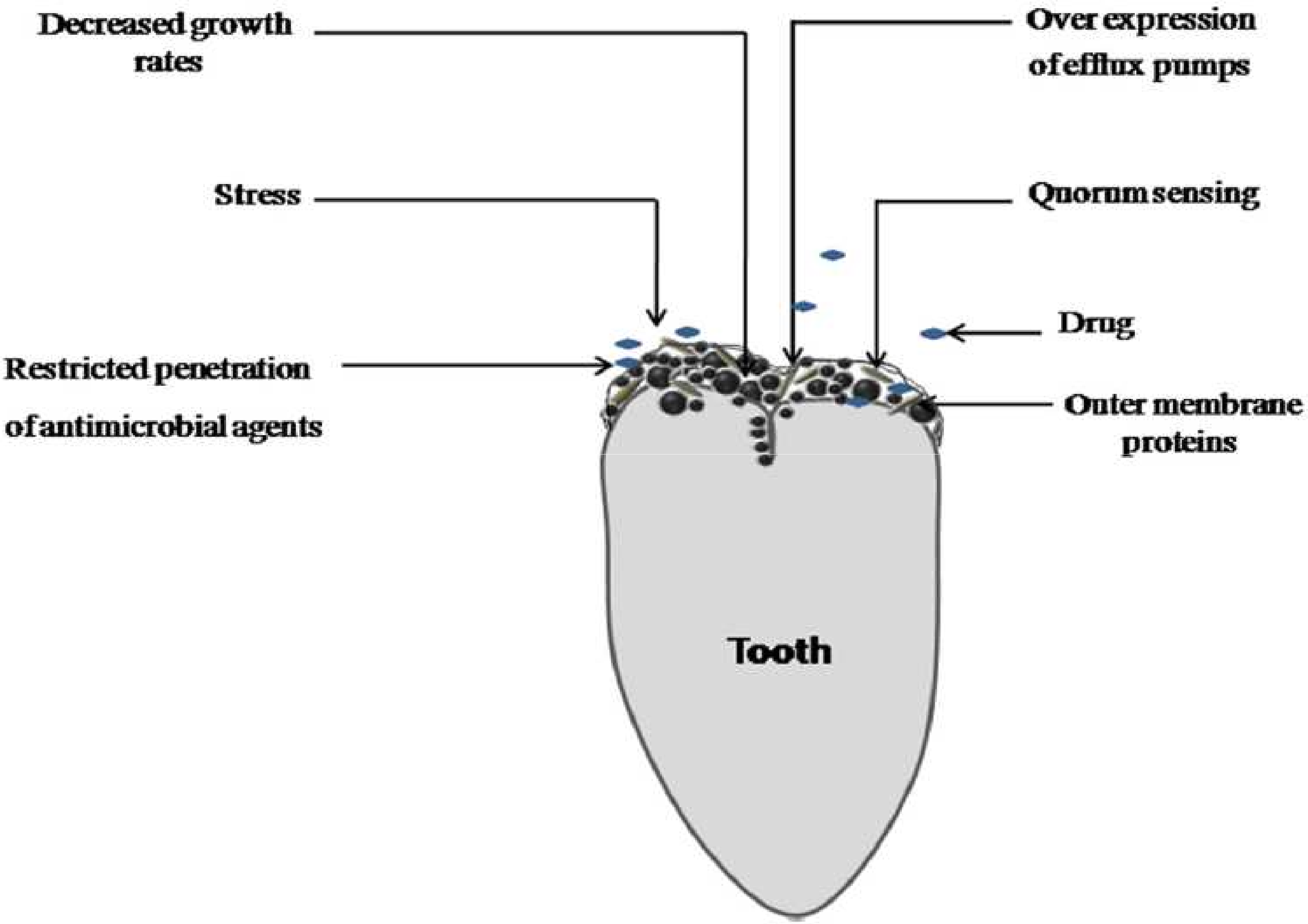

Fig. 1. A schematic presentation of mechanisms involved in drugs resistance of bacterial biofilms.

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Water Research

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Persistence of naturally occurring antibiotic resistance genes in the bacteria and bacteriophage fractions of wastewater

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Bioresource Technology xxx (2016) xxx–xxx

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Bioresource Technology

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Fate of antibiotic resistance bacteria and genes during enhanced anaerobic digestion of sewage sludge by microwave pretreatment

Juan Tong [a], Jibao Liu [a], Xiang Zheng [b], Junya Zhang [a], Xiaotang Ni [a], Meixue Chen [a], Yuansong Wei [a,c,*]

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Bioresource Technology

journal homepage: www.elsevier.com/locate/biortech

Fate of antibiotic resistance genes and its drivers during anaerobic co-digestion of food waste and sewage sludge based on microwave pretreatment

Junya Zhang [1], Meixue Chen [1], Qianwen Sui, Rui Wang, Juan Tong, Yuansong Wei *