



MISCH IMPLANT STUDY CLUB · SESSION 1

SAVING TEETH VS. REPLACING WITH IMPLANTS

Using the Periodontal Risk Score to decide which teeth to save, which to extract, and when a dental implant is the ideal replacement.



JONATHAN MISCH DDS, MS

- **Education:**

*University of Michigan School of Dentistry
University of Michigan School of Periodontics*

- **Private Practice**

Pinckney Implants & Periodontics

- **Academic Appointments**

Dean's Faculty University of Michigan

- **Non-Academic Appointments**

CEO, Misch Implant Institute

*Board of Directors, International Congress of
Oral Implantologists*

- **Research Topics:**

Prosthetic Influence on Peri-Implant Tissues

Peri-implant Diseases

Advanced Bone Augmentation

- **Reviewer:**

Journal of Periodontology

Clinical Oral Implants Research

Clinical Implant Dentistry & Related Research

International Journal of Oral Implantology



OFF THE CLOCK

Family

always comes first

Jaclyn, our son Logan — soon a big brother — two old labradors, Koda and Yogi, and a house in Michigan that is *never* quiet.

Jaclyn
WIFE

Logan
SON

+1
ON THE WAY

Koda & Yogi
LABRADORS





A LITTLE ABOUT ME

Michigan State

Spartan Football

Before pursuing a career in dentistry, I played football at Michigan State — I was a starting linebacker on the 2010 Big Ten Championship football team and played under Head Coach Mark Dantonio.

MSU

EAST LANSING

B1G

CONFERENCE

LB

POSITION





A LITTLE ABOUT ME

San Juan del Sur

Blood vs. Water

Before periodontics, I spent 39 days on a beach in Nicaragua competing on Season 29 of *Survivor* — playing alongside my now-wife, Jaclyn.



29
SEASON

2014
AIRED

39
DAYS

36
LBS LOST





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SAVING TEETH VS. REPLACING WITH IMPLANTS

Using the Periodontal Risk Score to decide which teeth to save, which to extract, and when a dental implant is the ideal replacement.



WHAT YOU'LL TAKE AWAY

LEARNING OBJECTIVES

A 45-minute framework — from prognosis, to score, to a defensible save-vs-extract decision.

- 01 Evaluate prognosis systems - strengths/weaknesses/usability
- 02 Discuss the biggest risk factors for tooth loss due to periodontitis and their biological mechanisms
- 03 Quantify how much each factor matters — hazard ratios, odds ratios, attributable risk.
- 04 Combine the score with the patient — hygiene, compliance, finances, wishes.
- 05 Walk the replacement ladder and explain when, for the right patient, the implant is ideal.
- 06 Recognize that the same factors that doom a tooth must be managed for the implant to succeed.



— PART ONE

How Do We Decide?

Every periodontally involved tooth forces the same question — invest in saving it, or extract and replace. A prognosis system is only useful if it changes what we do.



*We are good at predicting which teeth will **live** . We are bad at predicting which teeth will **die**.*

The older systems lean almost entirely on local findings and ignore the host. The next generation fixed this by adding the systemic factors.



FOUR DECADES OF REFINEMENT

THE EVOLUTION OF PROGNOSIS

1984

Becker

Good / questionable / hopeless. Intuitive but subjective.

1996

McGuire & Nunn

The classic five classes — the most widely taught system.

2007

Kwok & Caton

Reframed around the probability of progression vs. stability.

2014

Miller-McEntire

First to weight **systemic** factors. Outpredicted 10 systems.

2023

Periodontal Risk Score

The refined, validated successor — our anchor.

Each step added what the last one missed — ending with the host



MCGUIRE & NUNN 1996 · INSIDE THE BOX

THE CLASSIC FIVE CLASSES

1996

McGuire & Nunn

The classic five classes —
the most widely taught
system.

Good

Controllable etiology, adequate remaining support, easily maintained.

Fair

~25% attachment loss; Class I, cleansable furcation.

Poor

~50% attachment loss; Class II furcation — difficult but still cleansable.

Questionable

>50% loss, poor crown-to-root ratio, non-cleansable Class II/III furcation, mobility ≥ 2 .

Hopeless

Inadequate attachment to maintain the tooth.

Ok... The tooth is “Questionable”..... **NOW WHAT?**



MCGUIRE & NUNN 1996 — PROGNOSIS VS. ACTUAL OUTCOME

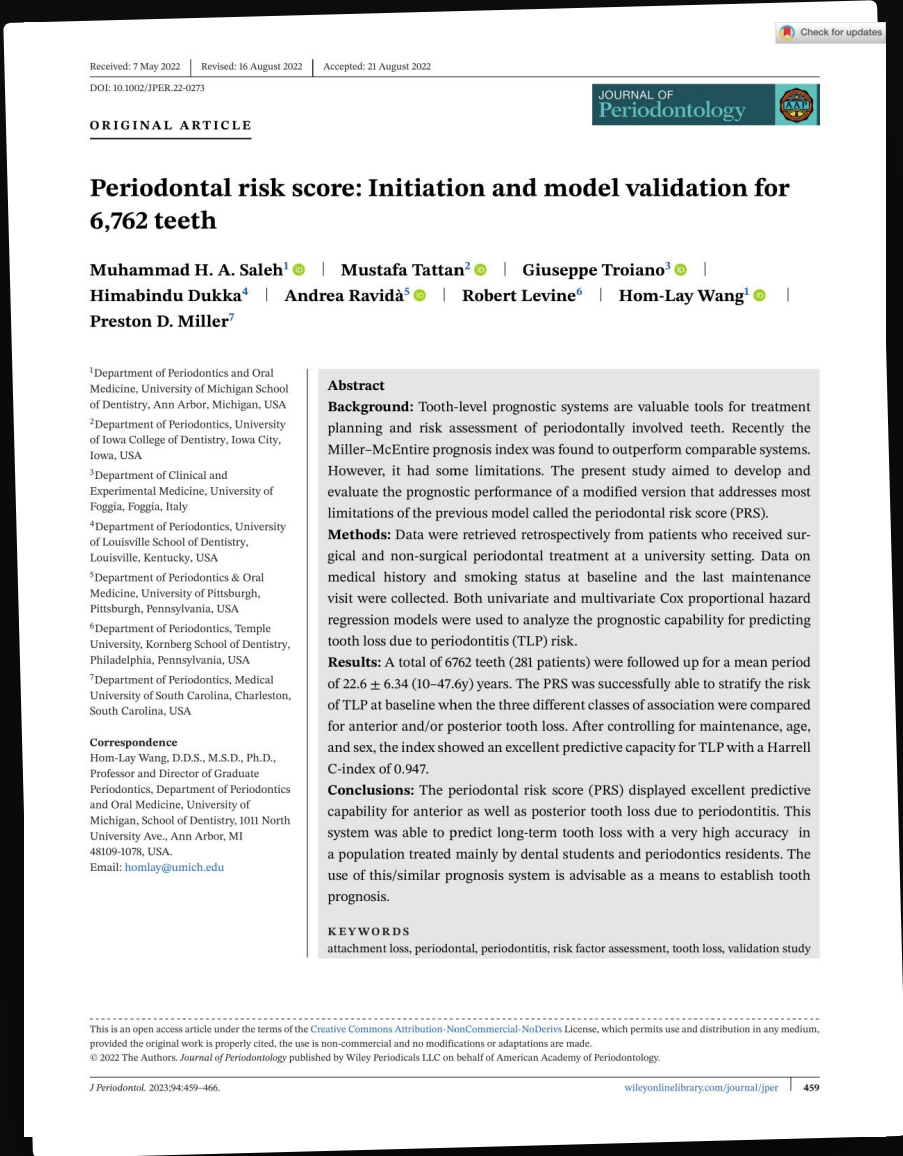
"Good"

was the only category they could predict reliably.
Accuracy collapsed for Fair, Poor and Questionable —
and worsened the further out they projected.





THE ANCHOR PAPER



Saleh, Tattan, Troiano, et al. *Periodontal Risk Score: initiation and model validation for 6,762 teeth.* J Periodontol 2023.

The Periodontal Risk Score

6,762 teeth · 281 treated patients · followed a mean of **22.6 years** (up to 47.6). It keeps the systemic insight, applies to **all** teeth, and collapses to three clear classes.

0.947

Harrell C-index — outstanding predictive accuracy

3.7×

Class 2 · Good

10.9×

Class 3 · Guarded

Risk of tooth loss vs. an Excellent tooth (multivariate). Seven measurable inputs → a validated, three-tier class.

Age

Smoking

HbA1c

Tooth type

Furcation

Probing depth

Mobility



— PART TWO

The Seven Risk Factors

Three systemic — age, smoking, HbA1c.

Four local — tooth type, furcation, probing depth, mobility.



THE SCORING INSTRUMENT

THE PRS CARD

Score the questioned tooth on each of the seven factors, add the points, and the total reads straight across to a class — and to its prognosis at 5–10 and 15–20 years.

Fill it out chairside. We will walk every row — and how each one is scored — from here.

1–4	Class 1 Excellent	98% 5–10 yr	96% 15–20 yr
5–7	Class 2 Good	95% 5–10 yr	90% 15–20 yr
8–11	Class 3 Guarded	89% 5–10 yr	67% 15–20 yr

Questioned Tooth				
Age				
Smoking				
Diabetes				
Tooth Type				
Mobility				
Probing depth				
Furcation				
TOTAL				
10-year prognosis				
20-year prognosis				



RISK FACTOR 01 · SYSTEMIC · MECHANISM

AGE

PRS asks: patient age — risk rises through the later decades.

A proxy for cumulative lifetime exposure and declining repair reserve — an older tooth has “banked” decades of insults. But maintenance largely neutralizes it.

A modifier, not a death sentence — push toward definitive, low-maintenance care.

FROM THE PRACTICE



From the practice · 76 y/o · residual pockets after SRP



RISK FACTOR 01 · SYSTEMIC · THE IMPACT

AGE

Real, but a modifier — maintenance can largely neutralize it.

~60%

of teeth lost by age 60–65
untreated — vs ~25%
when maintained
(Marshall-Day)

p = .011

independent
predictor of 30-yr
loss (Agudio 2023)

HIGHLIGHTED STUDY

Received: 19 August 2022 | Revised: 23 December 2022 | Accepted: 5 January 2023
DOI: 10.1111/jcpe.13770

ORIGINAL ARTICLE

Journal of Clinical
Periodontology WILEY

Longevity of teeth in patients susceptible to periodontitis: Clinical outcomes and risk factors associated with tooth loss after active therapy and 30 years of supportive periodontal care

Giancarlo Agudio¹ | Jacopo Buti² | Daniele Bonaccini³ |
Giovanna Pini Prato^{3,4} | Pierpaolo Cortellini^{3,4,5,6}

¹Private Practice, Bergamo, Italy
²Unit of Periodontology, UCL Eastman Dental
Institute, London, UK
³Private Practice, Florence, Italy
⁴Accademia Toscana di Ricerca
Odontostomatologica (ATRO), Florence, Italy
⁵European Research Group on Periodontology
(ERGOPERIO), Bern, Switzerland
⁶Department of Oral Health Sciences, KU
Leuven and Dentistry (Periodontology),
University Hospitals Leuven, Leuven, Belgium

Correspondence
Pierpaolo Cortellini, Via Carlo Botta 16, 50136
Florence, Italy.
Email: sandro@cortellini.org

Abstract

Aim: (i) To evaluate the efficacy of active periodontal therapy supplemented by supportive periodontal care (SPC) in retaining dentition during a 30-year follow-up period in patients susceptible to periodontitis, and (ii) to assess the prognostic factors associated with tooth loss.

Materials and Methods: One-hundred and fifty-four patients with periodontitis, retrospectively classified as stage I–IV and grade B–C periodontitis, treated between 1984 and 1986 in a private practice, were enrolled in this study. After periodontal assessment, patients received non-surgical treatment followed by surgical periodontal therapy, orthodontic treatment, and tooth-splinting, where appropriate. SPC consisted of a strict recall programme every 3–6 months over a 30-year period. Recurrences were treated either with subgingival root planing or flap surgery. Dental and periodontal variables were measured at baseline (T0), end of active therapy (T1), and after 25 (T2) and 30 (T3) years. Generalized mixed models were analysed to assess the prognostic factors associated with and survival analyses for tooth loss.

Results: Data on 154 patients (4083 teeth) were available at baseline (T0). Teeth considered unworthy of treatment were extracted during active therapy (160, 3.9%) and at re-assessment (13, 0.3%; T1). After 25 years of SPC, 140 teeth out of 3910 in 154 patients (3.6%) were lost (24 in 18 patients for periodontal reasons). Between 25 and 30 years, 20 patients (482 teeth) dropped out, and 61 teeth (2%) were lost (15 in 14 patients for periodontal reasons). Overall, 201 teeth (5.1%) were lost (39 for periodontal reasons) in 30 years of SPC. Generalized mixed models showed that stage III or stage IV periodontitis was associated with greater tooth loss during SPC compared to stage I or stage II (OR = 2.10; $p = .048$). Generalized periodontitis showed a statistically significant OR = 3.24 ($p = .016$) compared to the localized one. In SPC (T1–T3), age ($p = .011$), gender (male; $p = .038$), molar teeth ($p = < .001$), T0 and T1 pocket depth ($p = < .001$), tooth mobility grades 2 ($p = .018$) and 3 ($p = .050$), T0 and T1 bone loss ($p = < .001$), and presence of a root canal treatment ($p = < .001$) and a crown ($p = .009$) were statistically significantly associated with tooth loss.

520 | © 2023 John Wiley & Sons A/S. Published by John Wiley & Sons Ltd. [wileyonlinelibrary.com/journal/jcpe](https://onlinelibrary.wiley.com/doi/10.1111/jcpe.13770) | J Clin Periodontol. 2023;50:520–532.

Agudio et al. 2023 — 30 years of supportive care; age an independent predictor of tooth loss.

EFFECT SIZE · ADJUSTED HAZARD RATIO

HR 1.0 = baseline · scaled to the strongest factor

HR 1.27



RISK FACTOR 01 · SYSTEMIC · SCORING

AGE

How it scores: one threshold — the fortieth birthday.

The smallest weight on the card, and the only one that never comes back down.

POINTS ADDED TO THE PRS TOTAL

1 – 39 years

0

40 years and older

1

RISK FACTOR 02 · SYSTEMIC · MECHANISM

SMOKING

PRS asks: never / former / current-light / current-heavy — a dose, not a yes/no.

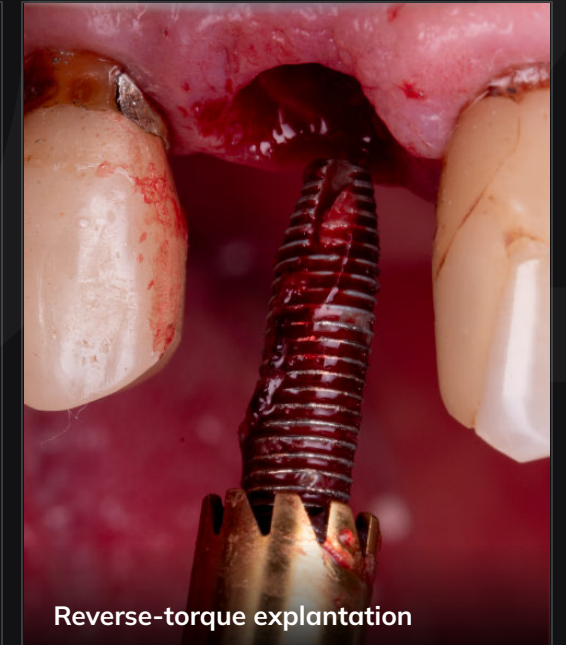
Attacks on three fronts — Biological (bleeds less, looks deceptively healthy), immunological, and microbiologically. The single most powerful **modifiable** factor in the score.

Quantify it in pack-years, document it, counsel cessation — washout is ~15 years.

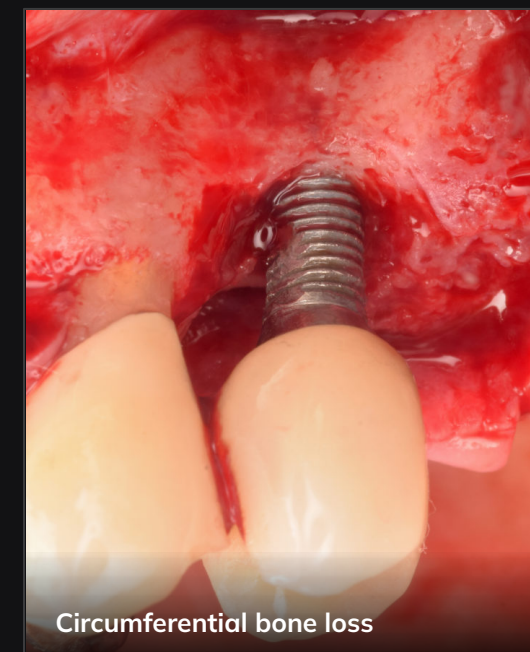
FROM THE PRACTICE



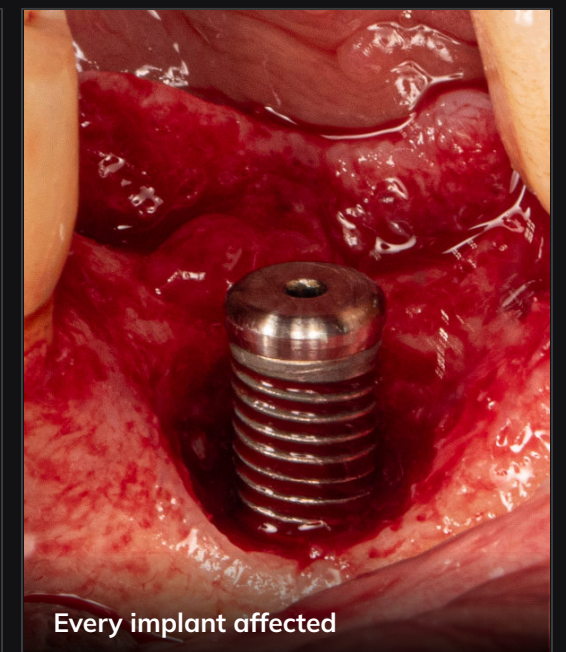
Thread exposed at gingiva



Reverse-torque explantation



Circumferential bone loss



Every implant affected

Smoker — every implant with severe peri-implantitis. The susceptibility, not just tooth loss.



RISK FACTOR 02 · SYSTEMIC · THE IMPACT

SMOKING

The single most powerful modifiable factor in the score.

3.97×

odds of periodontitis,
current vs never — DOSE
DEPENDENT (Tomar &
Asma 2000)

41.9%

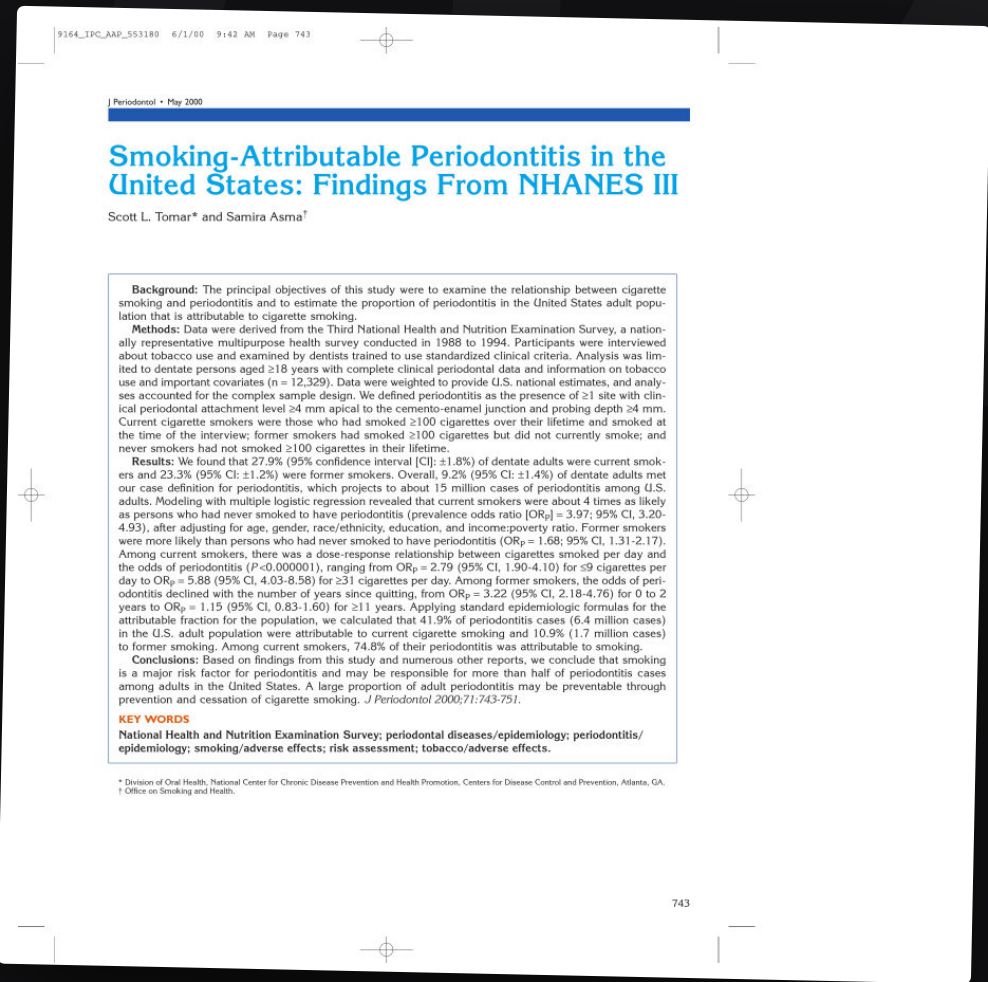
of all periodontitis
attributable to
smoking · 74.8% in
current smokers

EFFECT SIZE · ADJUSTED HAZARD RATIO

HR 1.0 = baseline · scaled to the strongest factor

HR 3.46

HIGHLIGHTED STUDY



Tomar & Asma 2000 — NHANES III (n = 12,329);
smoking-attributable periodontitis.



RISK FACTOR 02 · SYSTEMIC · THE WASHOUT

SMOKING

A history of periodontitis lengthens the washout.

GENERAL POPULATION

~10 yr

of cessation to match never-smoker risk (Tomar & Asma 2000)

TREATED PERIODONTITIS

~15 yr

of cessation to match never-smoker tooth-loss risk (Ravidà 2020)

Risk of periodontitis-related tooth loss fell 6% per year of cessation; a heavy smoker's tooth still carried 4.4× the risk of a never smoker's.

This is why the card draws the former-smoker line at fifteen years, not ten.

HIGHLIGHTED STUDY

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Journal of Clinical PeriodontologyWILEY

CLINICAL PERIODONTOLOGY

Dose-dependent effect of smoking and smoking cessation on periodontitis-related tooth loss during 10 - 47 years periodontal maintenance—A retrospective study in compliant cohort

Andrea Ravidà¹ | Giuseppe Troiano² | Musa Qazi¹ | Muhammad H. A. Saleh^{1,3} | Islam Saleh¹ | Wenche S. Borgnakke¹ | Hom-Lay Wang¹

¹Department of Periodontics and Oral Medicine, School of Dentistry, University of Michigan, Ann Arbor, MI, USA
²Department of Clinical and Experimental Medicine, University of Foggia, Foggia, Italy
³Department of Periodontics, University of Louisville School of Dentistry, Louisville, KY, USA

Correspondence
Wenche S. Borgnakke, Department of Periodontics and Oral Medicine, School of Dentistry, University of Michigan, 1011 North University Avenue, Ann Arbor, MI 48109-1078, USA.
Email: wsb@umich.edu

Funding Information
Department of Periodontics & Oral Medicine, University of Michigan School of Dentistry

Abstract
Aim: We retrospectively explored effects of smoking on tooth loss due to periodontitis (TLP) in long-term compliant patients.
Materials and Methods: Chart data were collected from 258 patients undergoing post-non-surgical periodontal treatment (mean 2.24 visits/year) for 10–47.5 (mean 24.2) years. Patients were categorized as: (1) never smokers, (2) former smokers, (3) current light smokers (<10 cigarettes/day) and (4) current heavy smokers (≥10 cigarettes/day).
Results: Of 6,590 teeth present at baseline (mean 25.6 teeth/patient), 264 teeth were lost due to periodontitis, corresponding to 0.03, 0.05, 0.08 and 0.11 TLP annually among never smokers, former smokers, current light smokers and current heavy smokers, respectively. A tooth from a current heavy smoker had 4.4-fold, 2.7-fold and 2.6-fold greater risk of TLP than a tooth from a never smoker, a current light smoker and a former smoker, respectively. Both heavy and light former smokers needed washout periods of approximately 15 years to reach the TLP risk level of never smokers. The TLP risk decreased by 6%/year of smoking cessation.
Conclusions: It took almost 15 years of smoking cessation for the risk of TLP among former smokers to reach the level of never smokers. Hence, the 2018 periodontitis grading system should consider the impact of the “washout” period on former smokers.

KEYWORDS
cigarette smoking, mouth diseases, periodontitis, tooth extraction, validation study

1 | INTRODUCTION
Periodontal diseases are among the most prevalent diseases in adults (Albandar, 2005; Petersen & Ogawa, 2012). Periodontitis affects around 75% of seniors (Albandar, 2005; Eke et al., 2018), and severe periodontitis is the sixth most prevalent chronic disease in the world (Kassebaum et al., 2014) affecting about 11%–15% of adults (Dye, 2012; Eke et al., 2018; Kassebaum et al., 2014).

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1132 | wileyonlinelibrary.com/journal/jcpe J Clin Periodontol. 2020;47:1132–1143.

Ravidà et al. 2020 — 258 compliant patients, 6,590 teeth, 10–47.5 yr maintenance; washout ≈ 15 yr.

EFFECT SIZE · ADJUSTED HAZARD RATIO

HR 1.0 = baseline · scaled to the strongest factor

HR 3.46



RISK FACTOR 02 · SYSTEMIC · SCORING

SMOKING

How it scores: dose and recency both count — score the current habit, or the years since quitting.

Four points at the top — the heaviest single item on the card, and the one the patient can undo.

POINTS ADDED TO THE PRS TOTAL

Non-smoker

0

Light smoker

≤ 10 cigarettes / day

2

Heavy smoker

≥ 10 cigarettes / day

4

Former smoker

≤ 15 years post smoking

2

Former smoker

≥ 15 years post smoking

0



RISK FACTOR 03 · SYSTEMIC · MECHANISM

HbA1c

PRS asks: the actual HbA1c — degree of control, not a diabetic yes/no.

Hyperglycemia drives AGEs → hyperinflammation, impaired neutrophils, crippled collagen and healing, and net bone loss. A two-way street with glycemic control.

Co-manage with the physician — an improving A1c can change the plan.

FROM THE PRACTICE



72 y/o male · A1c 10.2 at presentation → 8.1 at surgery → 7.6 at one year.



RISK FACTOR 03 · SYSTEMIC · THE IMPACT

HBA1C

Risk tracks the number, not the label.

2.8–3.4×

odds of destructive periodontitis — independent after adjustment (Emrich 1991, Pima)

6.5% ≠ 9.5%

risk tracks the number, not the label (Mealey; Sanz 2018)

EFFECT SIZE · ADJUSTED HAZARD RATIO

HR 1.0 = baseline · scaled to the strongest factor

HR 2.80

HIGHLIGHTED STUDY

Periodontal Disease in Non-Insulin-Dependent Diabetes Mellitus

Lawrence J. Emrich,*[†] Marc Shlossman,[‡] and Robert J. Genco[‡]

THE RELATIONSHIP BETWEEN DIABETES MELLITUS and oral health status was determined in Pima Indians from the Gila River Indian Community in Arizona. This tribe of native Americans has the world's highest reported incidence and prevalence of non-insulin-dependent (type 2) diabetes mellitus. The probing attachment level, alveolar bone loss, age, sex, Calculus Index, Plaque Index, Gingival Index, fluorosis, and DMFT as well as the diabetic status was assessed in 1,342 Pima Indians who were at least partially dentate. The prevalence and severity of destructive periodontal disease was determined by measuring probing attachment loss and radiographically apparent interproximal crestal alveolar bone loss, two independent but correlated indicators of periodontal destruction. Only diabetic status, age, and the presence of subgingival calculus were significantly associated with both increased prevalence and greater severity of destructive periodontal disease in this population. Diabetic status was significantly and strongly related to both the prevalence and severity of disease after adjusting for the effects of demographic variables and several indices of oral health including the Plaque Index. Subjects with type 2 diabetes have an increased risk of destructive periodontitis with an odds ratio of 2.81 (95% confidence interval 1.91 to 4.13) when attachment loss is used to measure the disease. The odds ratio for diabetic subjects was 3.43 (95% confidence interval 2.28 to 5.16) where bone loss was used to measure periodontal destruction. These findings demonstrate that diabetes increases the risk of developing destructive periodontal disease about threefold. Furthermore, diabetes increases the risk of developing periodontal disease in a manner which cannot be explained on the basis of age, sex, and hygiene or other dental measures. Periodontitis should be considered a potential complication of diabetes in evaluation of patients. *J Periodontol* 1991; 62:123–130.

Key Words: Indians, North American; diabetes, mellitus; oral health index; periodontal diseases/epidemiology; periodontal diseases/etiology.

Diabetes is a chronic metabolic disorder that affects 6% of the American population. Much of the information currently available concerning the relationship between diabetes and oral conditions, and most notably periodontal disease, has been obtained from the study of convenience samples such as patients attending diabetic clinics.^{1–9} This method may favor selection of patients with symptoms and complications, and may under-represent those with asymptomatic carbohydrate intolerance, mild symptoms, or those who have not sought medical care. We sought to provide a description of the clinical characteristics of diabetes-related periodontal disease, especially in its earliest stages, by the systematic examination of these relationships in a

large population not selected on the basis of their systemic or oral disease status.

The Pima Indians of the Gila River Indian Community in Arizona have the highest recorded incidence and prevalence of type 2 diabetes in the world.¹⁰ Fifty percent of those above 35 years of age have diabetes.^{10–12} Diabetes mellitus in the Pimas is exclusively type 2, or non-insulin-dependent diabetes mellitus, and exhibits progression and complications comparable to other populations with type 2 diabetes.^{13,14} This tribe has been under continuous epidemiologic investigation since 1965 by the National Institute of Diabetes, Digestive and Kidney Diseases (NIDDK) in Phoenix, Arizona.¹⁴

An epidemiologic study of the oral health of the Pima Indians was added to the investigations in 1983. The objectives of this study were 1) to estimate the prevalence and severity of periodontal disease; 2) to study the relationship

Emrich, Shlossman & Genco 1991 — periodontal disease in NIDDM, Pima (n = 1,342).



RISK FACTOR 03 · SYSTEMIC · SCORING

HBA1C

How it scores: five bands read straight off the lab value — not a diabetic yes/no.

Ties with smoking at four points — and it is the one item the physician can move for you.

POINTS ADDED TO THE PRS TOTAL

Below 6	0
6.1 – 7.0	1
7.1 – 8.0	2
8.1 – 9.0	3
9.1 and above	4

RISK FACTOR 04 · LOCAL · MECHANISM

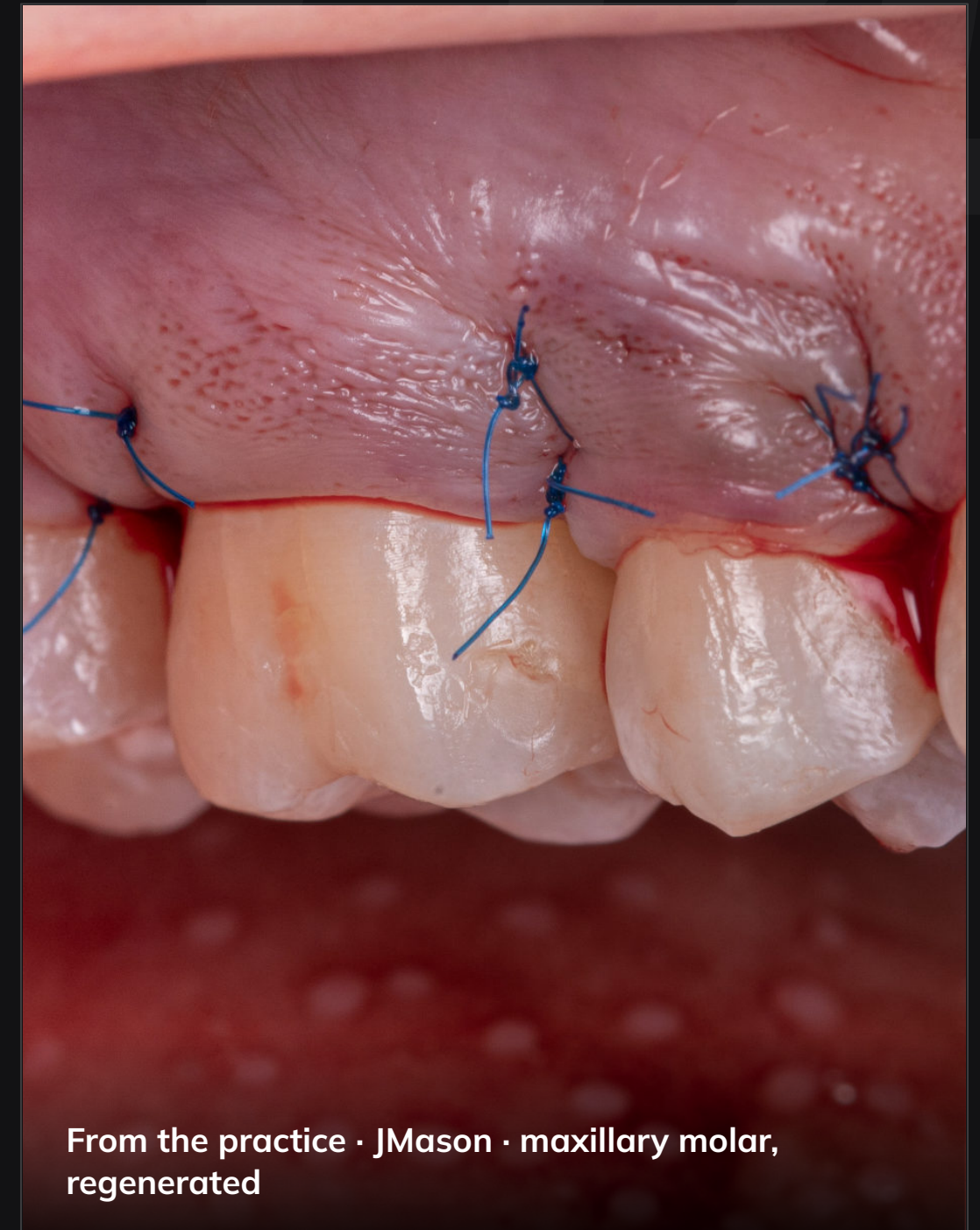
TOOTH TYPE

PRS asks: molar vs non-molar — single roots auto-score 0 on furcation items.

Molars carry furcations, concavities and long root trunks, bear the heaviest load, and sit where access is worst. Tooth type is largely a stand-in for furcation anatomy.

A furcated molar with a deep pocket is the prototypical Guarded tooth.

FROM THE PRACTICE



From the practice · JMason · maxillary molar, regenerated



RISK FACTOR 04 · LOCAL · THE IMPACT

TOOTH TYPE

Largely a stand-in for furcation anatomy.

~3x

risk of periodontal loss,
molar vs incisor (Saleh
2023)

Canines protective
molars lost most over
~22 yr (Hirschfeld
1978)

EFFECT SIZE · ADJUSTED HAZARD RATIO



HR 1.0 = baseline · scaled to the strongest factor

HR 1.20

HIGHLIGHTED STUDY

A Long-Term Survey of Tooth Loss in 600 Treated Periodontal Patients

by
LEONARD HIRSCHFELD, D.D.S.*
BERNARD WASSERMAN, D.D.S.*

THE MAIN GOAL of periodontal treatment is the retention of as many teeth as possible in health, function, and comfort. Since periodontal disease is chronic, the best means of evaluating the effectiveness of treatment is to observe large numbers of well-documented cases over a long period of time. It would be ideal to compare equal numbers of treated and untreated patients, similarly documented. However, the obligations of clinical practice preclude such an approach. In recent years, a number of short term (2 to 5 years) studies have tested the effects of various preventive techniques on the course of periodontal disease.¹⁻³ Specific methods of pocket elimination have been evaluated by Ramfjord⁴ and Lindhe⁵ in longitudinal studies. Oliver⁶ reported on tooth mortality in 422 patients averaging 10 years after active treatment. Similar evaluations of tooth mortality were carried out by Ross⁷ and Stern.⁸ This survey was undertaken to obtain data from treated patients maintained over a period of more than 15 years.

STUDY POPULATION

Six hundred patients who had been treated at least 15 years previously were recharted, photographed and radiographed. They were taken in consecutive order from the daily lists of a private practice. The first patients were recharted in 1966 and the last in 1971. Only patients with inadequate original documentation were rejected. Some patients had been treated many years before by Dr. Isador Hirschfeld, but most were originally cared for by the authors. All patients had been under periodic maintenance at 4- to 6-month intervals. The patients were predominantly Caucasian, from the middle economic levels, and generally well-motivated in their personal and professional dental care. There were twice as many females, 391 (65.2%), as males, 209 (34.8%), but there was no observable sex difference in the severity of disease at the original examination.

At the time of initial treatment, 498 (83%) of the

600 patients were below 50 years of age (Table 1), with 362 (60.3%) between the ages of 35 and 49. The average age of all patients was 42.

The distribution of patients according to years of maintenance can be seen in Table 2. Four patients originally had been treated more than 50 years before this survey, 19 more than 40 years before, and 60 more than 30 years before. The average duration of maintenance was 22 years and the median was 20 years.

At the original examination of all patients, and at reexamination, the periodontal condition was charted with graphic representations of pocket depth, degrees of mobility, gingival recession, and furcation involvement as described by Isador Hirschfeld.⁹ All patients charted after 1949 had pockets measured in millimeters.

A tooth was considered to have a questionable prognosis if it had one or more of the following:

- Furcation involvement
- A deep noneradicateable pocket
- Extensive alveolar bone loss
- Marked mobility in conjunction with pocket depth (two or two-and-a-half degrees on a scale of three).

The patients were re-examined and the periodontal condition recorded in essentially the same manner during this survey.

The loss of teeth from periodontal causes over the study period was determined by comparing the initial and re-examination charting and reviewing the treatment history in the chart. Teeth lost during initial treatment were not counted as being lost during the survey period. If no specific information in the records indicated that a tooth was lost as the result of caries or periapical pathology, it was assumed that it was lost for periodontal reasons.

The severity of periodontal disease at the time of initial examination was divided into the following categories:

- Early: pockets of 4 mm or less, generally with gingival inflammation and subgingival calculus deposits.
- Intermediate: pockets of 4 to 7 mm present about a number of teeth.
- Advanced: pockets deeper than 7 mm, furcation involvement of at least one tooth.

Of the 600 patients studied, 459 (76.5%) were initially classified as having advanced periodontal disease, while 99 (16.5%) had disease of intermediate severity. Only 42 patients (7.0%) exhibited early disease. In most individuals there were varying degrees of involvement of different teeth.

As the survey progressed, it became clear that the patients differed markedly in post-treatment course. Therefore, since the total tallies provided only limited

Hirschfeld & Wasserman 1978 — tooth loss in 600 treated patients; molars lost most.



RISK FACTOR 04 · LOCAL · SCORING

TOOTH TYPE

How it scores: maxillary molars are scored separately — the mandibular molar scores zero.

Not molar versus non-molar. The anatomy the card is worried about is maxillary.

POINTS ADDED TO THE PRS TOTAL

Non-molar	0
Mandibular molar	0
Maxillary 1st molar	1
Maxillary 2nd molar	2



RISK FACTOR 05 · LOCAL · MECHANISM

FURCATION

PRS asks: grade 0 (none) through 3 (through-and-through).

A protected biofilm reservoir conventional therapy can't reliably resolve.
Grade is everything — flagging “furcation present” is not enough.

“Can the patient actually clean it?” is the decisive question.

FROM THE PRACTICE



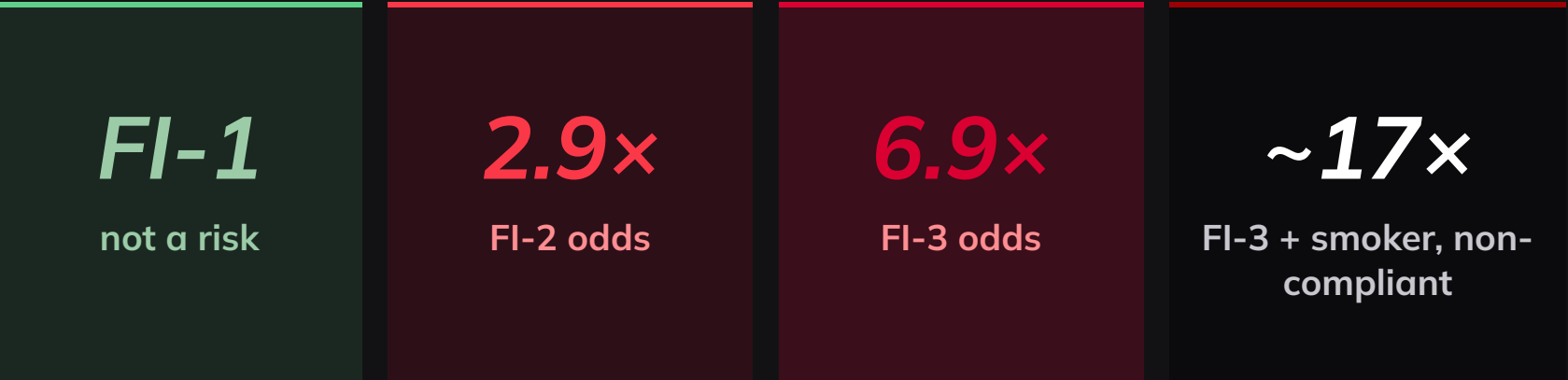
From the practice · Grade III through-and-through furcation



RISK FACTOR 05 · LOCAL · THE IMPACT

FURCATION

Grade is everything — risk climbs stepwise.



Salvi 2014 · 15-yr survival 92 / 86 / 75 / 62% by grade (Graetz 2015)

EFFECT SIZE · ADJUSTED HAZARD RATIO



HR 1.0 = baseline · scaled to the strongest factor

HR **1.21**

HIGHLIGHTED STUDY

J Clin Periodontol 2014; 41: 701–707 doi: 10.1111/jcpe.12266

Journal of Clinical Periodontology

Risk factors associated with the longevity of multi-rooted teeth. Long-term outcomes after active and supportive periodontal therapy

Giovanni E. Salvi¹, Daniel C. Mischler², Kurt Schmidlin³, Giedre Matulienė⁴, Bjarni E. Pjetursson⁵, Urs Brägger⁶ and Niklaus P. Lang⁷

¹Department of Periodontology, School of Dental Medicine, University of Bern, Bern, Switzerland; ²Private Practice, Koppigen, Switzerland; ³Institute for Social and Preventive Medicine, University of Bern, Bern, Switzerland; ⁴Private Practice, Zürich, Switzerland; ⁵University of Iceland, Reykjavik, Iceland; ⁶Division of Fixed Prosthodontics, School of Dental Medicine, University of Bern, Bern, Switzerland; ⁷Professor Emeritus, School of Dental Medicine, University of Bern, Bern, Switzerland

Salvi GE, Mischler DC, Schmidlin K, Matulienė G, Pjetursson BE, Brägger U, Lang NP. Risk factors associated with the longevity of multi-rooted teeth. Long-term outcomes after active and supportive periodontal therapy. J Clin Periodontol 2014; 41: 701–707. doi: 10.1111/jcpe.12266.

Abstract
Aim: To investigate risk factors for the loss of multi-rooted teeth (MRT) in subjects treated for periodontitis and enrolled in supportive periodontal therapy (SPT).
Material and Methods: A total of 172 subjects were examined before (T0) and after active periodontal therapy (APT)(T1) and following a mean of 11.5 ± 5.2 (SD) years of SPT (T2). The association of risk factors with loss of MRT was analysed with multilevel logistic regression. The tooth was the unit of analysis.
Results: Furcation involvement (FI) = 1 before APT was not a risk factor for tooth loss compared with FI = 0 ($p = 0.37$). Between T0 and T2, MRT with FI = 2 (OR: 2.92, 95% CI: 1.68, 5.06, $p = 0.0001$) and FI = 3 (OR: 6.85, 95% CI: 3.40, 13.83, $p < 0.0001$) were at a significantly higher risk to be lost compared with those with FI = 0. During SPT, smokers lost significantly more MRT compared with non-smokers (OR: 2.37, 95% CI: 1.05, 5.35, $p = 0.04$). Non-smoking and compliant subjects with FI = 0/1 at T1 lost significantly less MRT during SPT compared with non-compliant smokers with FI = 2 (OR: 10.11, 95% CI: 2.91, 35.11, $p < 0.0001$) and FI = 3 (OR: 17.18, 95% CI: 4.98, 59.28, $p < 0.0001$) respectively.
Conclusions: FI = 1 was not a risk factor for tooth loss compared with FI = 0. FI = 2/3, smoking and lack of compliance with regular SPT represented risk factors for the loss of MRT in subjects treated for periodontitis.

Key words: furcation involvement; periodontitis; smoking; supportive periodontal therapy; tooth loss

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Conflict of interest and source of funding statement
The authors declare no conflicts of interest. The study was supported by the Clinical Research Foundation (CRF) for the Promotion of Oral Health, Brienz, Switzerland.

Based on their anatomical features, their difficult access to professional (Fleischer et al. 1989) and self-performed (Lang et al. 1973) plaque control, the treatment of multi-rooted teeth represents a challenge for the clinician. Outcomes from clinical trials showed that molars with furcation involvement (FI) responded less favourably to non-surgical periodontal therapy compared with molars without FI and were more prone to experience further attachment loss (Nordland et al. 1987, Loos et al. 1989). A wide range of treatment modalities including non-surgical and

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Salvi et al. 2014 — furcation involvement & tooth loss; 172 patients, 11.5-yr SPT.



05

POINTS ADDED TO THE PRS TOTAL

RISK FACTOR 05 · LOCAL · SCORING

FURCATION

How it scores: grade it, do not flag it — and through-and-through scores with grade 3.

Grade I costs one point. Grade III costs three — and three points can move a tooth a whole class.

None	0
Grade 1	1
Grade 2	2
Grade 3	3

RISK FACTOR 06 · LOCAL · MECHANISM

PROBING DEPTH

PRS asks: shallow (≤ 3) · moderate (4–6) · deep (7+ mm).

A residual deep pocket is incomplete treatment, not maintenance — every residual millimetre multiplies risk. It is the most direct measure of how much disease is still active.

The most dynamic factor — re-score after initial therapy.

FROM THE PRACTICE



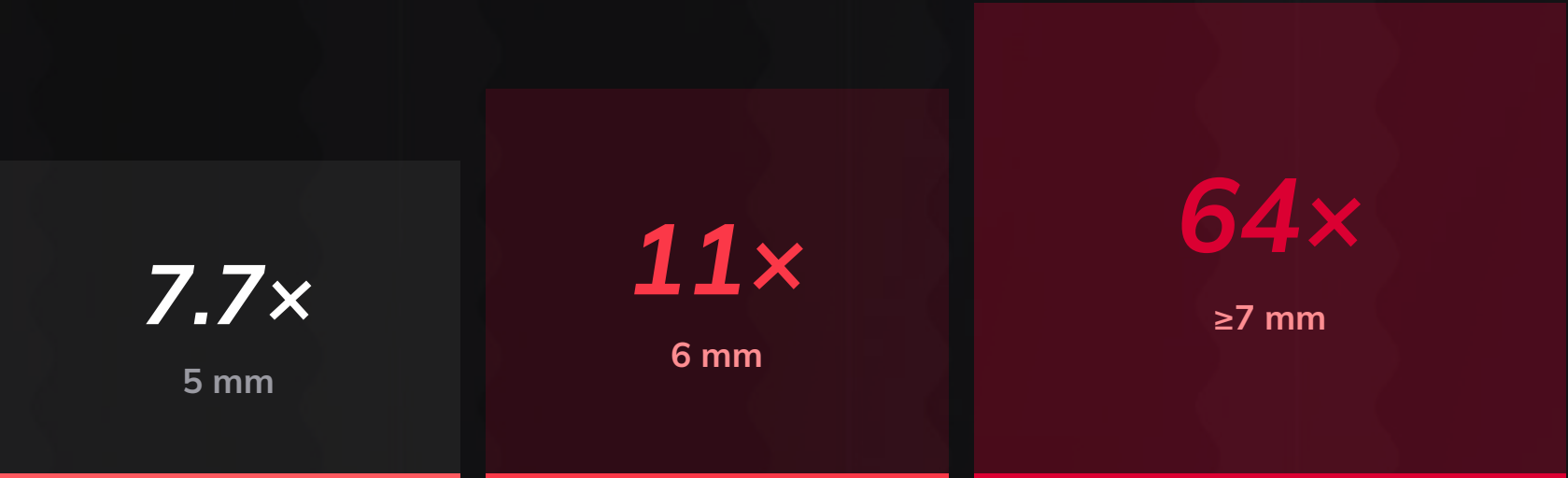
From the practice · #25 · 9–10 mm circumferential



RISK FACTOR 06 · LOCAL · THE IMPACT

PROBING DEPTH

Every residual millimetre multiplies the risk.



Tooth-loss odds vs ≤3 mm — Matuliene 2008 (172 patients, up to 27 yr)

EFFECT SIZE · ADJUSTED HAZARD RATIO



HIGHLIGHTED STUDY

Journal of Clinical Periodontology

Official Journal of The European Federation of Periodontology

Founded by the British, Dutch, French, German, Scandinavian, and Swiss Societies of Periodontology

Journal of Clinical Periodontology

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J Clin Periodontol 2008; 35: 685–695 doi: 10.1111/j.1600-051X.2008.01245.x

Influence of residual pockets on progression of periodontitis and tooth loss: Results after 11 years of maintenance

Giedre Matuliene¹, Bjarni E. Pjetursson¹, Giovanni E. Salvi¹, Kurt Schmidlin², Urs Brägger¹, Marcel Zwahlen³ and Niklaus P. Lang^{1,4}

¹School of Dental Medicine, University of Berne, Berne, Switzerland; ²Research Support Unit, Institute for Social and Preventive Medicine, University of Berne, Berne, Switzerland; ³University of Hong Kong, Hong Kong SAR, China

Matuliene G, Pjetursson BE, Salvi GE, Schmidlin K, Brägger U, Zwahlen M, Lang NP. Influence of residual pockets on progression of periodontitis and tooth loss: Results after 11 years of maintenance. *J Clin Periodontol* 2008; 35: 685–695. doi: 10.1111/j.1600-051X.2008.01245.x.

Abstract
Background: Limited evidence exists on the significance of residual probing pocket depth (PPD) as a predictive parameter for periodontal disease progression and tooth loss.
Aim: The aim of this study was to investigate the influence of residual PPD ≥5 mm and bleeding on probing (BOP) after active periodontal therapy (APT) on the progression of periodontitis and tooth loss.
Material and Methods: In this retrospective cohort, 172 patients were examined after APT and supportive periodontal therapy (SPT) for 3–27 years (mean 11.3 years). Analyses were conducted using information at site, tooth and patient levels. The association of risk factors with tooth loss and progression of periodontitis was investigated using multilevel logistic regression analysis.
Results: The number of residual PPD increased during SPT. Compared with PPD ≤3 mm, PPD = 5 mm represented a risk factor for tooth loss with odds ratios of 5.8 and 7.7, respectively, at site and tooth levels. The corresponding odds ratios for PPD = 6 mm were 9.3 and 11.0 and for PPD ≥7 mm 37.9 and 64.2, respectively. At patient level, heavy smoking, initial diagnosis, duration of SPT and PPD ≥6 mm were risk factors for disease progression, while PPD ≥6 mm and BOP ≥30% represented a risk for tooth loss.
Conclusion: Residual PPD ≥6 mm represent an incomplete periodontal treatment outcome and require further therapy.

Key words: bleeding on probing; clinical attachment level; maintenance care; periodontitis; progression; residual probing depth; risk factors; supportive periodontal therapy; tooth loss

Accepted for publication 6 April 2008

The goal of periodontal therapy is to arrest progressive attachment loss, and hence to prevent further disease progression, and eventually tooth loss.

Several longitudinal clinical studies documented the successful achievement of such treatment goals, provided that comprehensive periodontal therapy was followed by regularly attended and performed maintenance care (Knowles et al. 1979, Axelsson & Lindhe 1981a, b, Pihlström et al. 1983, Kaldahl et al. 1996, Rosling et al. 2001). With a rigid maintenance care programme over 30 years, further attachment loss concomitant with an almost complete prevention of dental caries lesions was demonstrated (Axelsson et al. 2004).

However, even in groups of patients who were extremely well controlled and in which periodontal stability was maintained over long periods of time (Lindhe & Nyman 1984, Rosling et al. 2001), recurrence of the periodontal disease was not completely prevented. Episodes of clinical attachment and tooth loss clustered in sub-populations of approximately one-fourth (Lindhe & Nyman 1984) to one-fifth (Rosling et al. 2001) of the population treated. It is evident from such studies that high susceptibility patients who may exhibit disease

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Matuliene et al. 2008 — residual pockets, progression & tooth loss.

HR 1.0 = baseline · scaled to the strongest factor



HR 2.20



RISK FACTOR 06 · LOCAL · SCORING

PROBING DEPTH

How it scores: four bands, measured in millimetres at the deepest site.

Re-score this row after initial therapy — it is the item most likely to have changed.

POINTS ADDED TO THE PRS TOTAL

Less than 5 mm	0
5 – 7 mm	1
8 – 10 mm	2
Greater than 10 mm	3



RISK FACTOR 07 · LOCAL · MECHANISM

MOBILITY

PRS asks: Miller grade 0 (physiologic) through 3 (severe).

Integrates lost support and occlusal trauma. **Trend beats snapshot** — stable mobility can be maintained; *increasing* mobility is the red flag.

Grade 1 reassure; grade 2 investigate occlusion; grade 3 with deep pockets favors extraction.

FROM THE PRACTICE



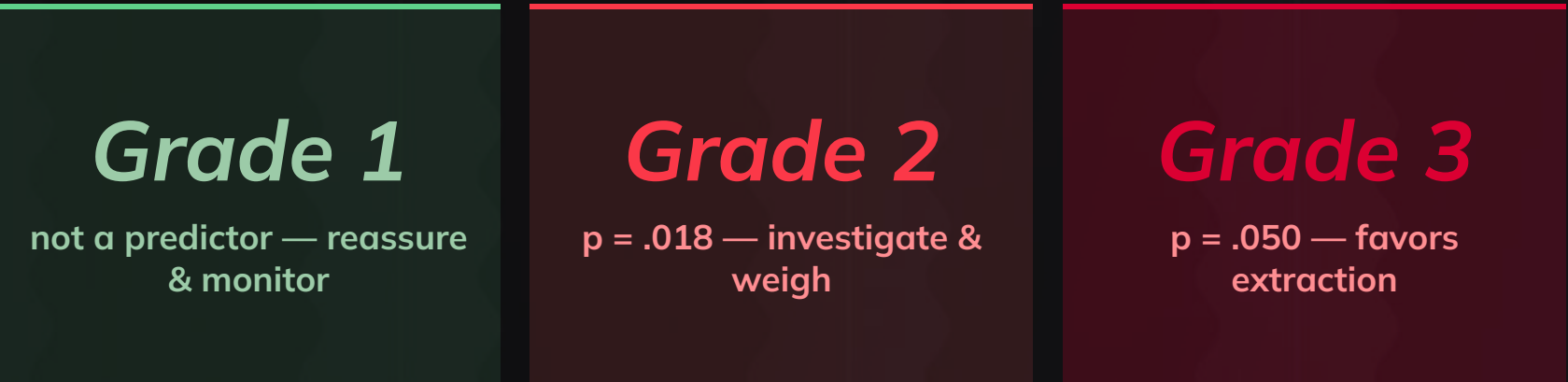
From the practice · Julie #10 · occlusal trauma, pre-tx splint



RISK FACTOR 07 · LOCAL · THE IMPACT

MOBILITY

Grade 2 and 3 independently predict loss.



Independent predictors of 30-yr tooth loss — Agudio 2023

EFFECT SIZE · ADJUSTED HAZARD RATIO



HR 1.0 = baseline · scaled to the strongest factor

HR 2.08

HIGHLIGHTED STUDY

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DOI: 10.1111/jcpe.13770

ORIGINAL ARTICLE

Journal of Clinical PeriodontologyWILEY

Longevity of teeth in patients susceptible to periodontitis: Clinical outcomes and risk factors associated with tooth loss after active therapy and 30 years of supportive periodontal care

Giancarlo Agudio¹ | Jacopo Buti² | Daniele Bonaccini³ | Giovanpaolo Pini Prato^{3,4} | Pierpaolo Cortellini^{3,4,5,6}

¹Private Practice, Bergamo, Italy
²Unit of Periodontology, UCL Eastman Dental Institute, London, UK
³Private Practice, Florence, Italy
⁴Accademia Toscana di Ricerca Odontostomatologica (ATRO), Florence, Italy
⁵European Research Group on Periodontology (ERGOPERIO), Bern, Switzerland
⁶Department of Oral Health Sciences, KU Leuven and Dentistry (Periodontology), University Hospitals Leuven, Leuven, Belgium

Correspondence
Pierpaolo Cortellini, Via Carlo Botta 16, 50136 Florence, Italy.
Email: sandro@cortellini.org

Abstract
Aim: (i) To evaluate the efficacy of active periodontal therapy supplemented by supportive periodontal care (SPC) in retaining dentition during a 30-year follow-up period in patients susceptible to periodontitis, and (ii) to assess the prognostic factors associated with tooth loss.
Materials and Methods: One-hundred and fifty-four patients with periodontitis, retrospectively classified as stage I–IV and grade B–C periodontitis, treated between 1984 and 1986 in a private practice, were enrolled in this study. After periodontal assessment, patients received non-surgical treatment followed by surgical periodontal therapy, orthodontic treatment, and tooth-splinting, where appropriate. SPC consisted of a strict recall programme every 3–6 months over a 30-year period. Recurrences were treated either with subgingival root planing or flap surgery. Dental and periodontal variables were measured at baseline (T0), end of active therapy (T1), and after 25 (T2) and 30 (T3) years. Generalized mixed models were analysed to assess the prognostic factors associated with and survival analyses for tooth loss.
Results: Data on 154 patients (4083 teeth) were available at baseline (T0). Teeth considered unworthy of treatment were extracted during active therapy (160, 3.9%) and at re-assessment (13, 0.3%; T1). After 25 years of SPC, 140 teeth out of 3910 in 154 patients (3.6%) were lost (24 in 18 patients for periodontal reasons). Between 25 and 30 years, 20 patients (482 teeth) dropped out, and 61 teeth (2%) were lost (15 in 14 patients for periodontal reasons). Overall, 201 teeth (5.1%) were lost (39 for periodontal reasons) in 30 years of SPC. Generalized mixed models showed that stage III or stage IV periodontitis was associated with greater tooth loss during SPC compared to stage I or stage II (OR = 2.10; p = .048). Generalized periodontitis showed a statistically significant OR = 3.24 (p = .016) compared to the localized one. In SPC (T1–T3), age (p = .011), gender (male; p = .038), molar teeth (p = < .001), T0 and T1 pocket depth (p = < .001), tooth mobility grades 2 (p = .018) and 3 (p = .050), T0 and T1 bone loss (p = < .001), and presence of a root canal treatment (p = < .001) and a crown (p = .009) were statistically significantly associated with tooth loss.

520 | © 2023 John Wiley & Sons A/S. Published by John Wiley & Sons Ltd. [wileyonlinelibrary.com/journal/jcpe](https://onlinelibrary.wiley.com/doi/10.1111/jcpe.13770) | J Clin Periodontol. 2023;50:520–532.

Agudio et al. 2023 — mobility grades 2 & 3 independently predict tooth loss.



RISK FACTOR 07 · LOCAL · SCORING

MOBILITY

How it scores: Miller grade, scored one for one.

Grade equals points — the simplest row on the card, and the one the patient can feel.

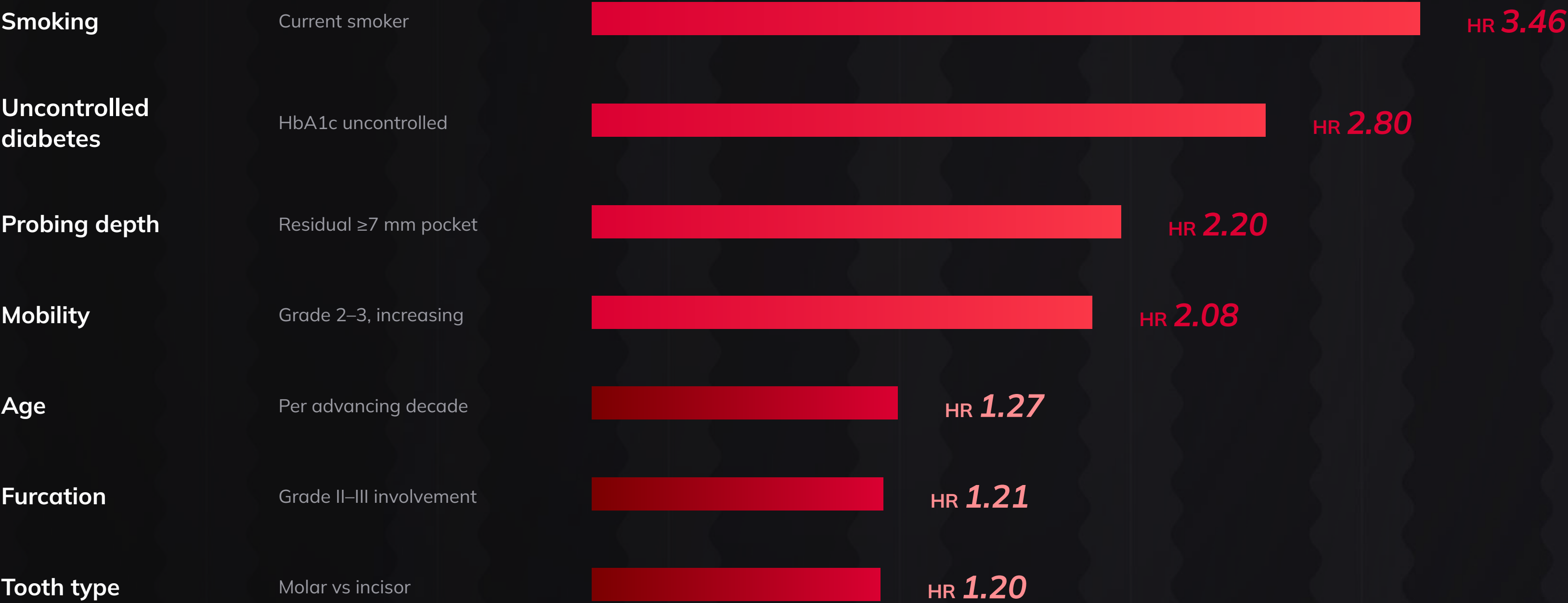
POINTS ADDED TO THE PRS TOTAL

None	0
Grade 1	1
Grade 2	2
Grade 3	3



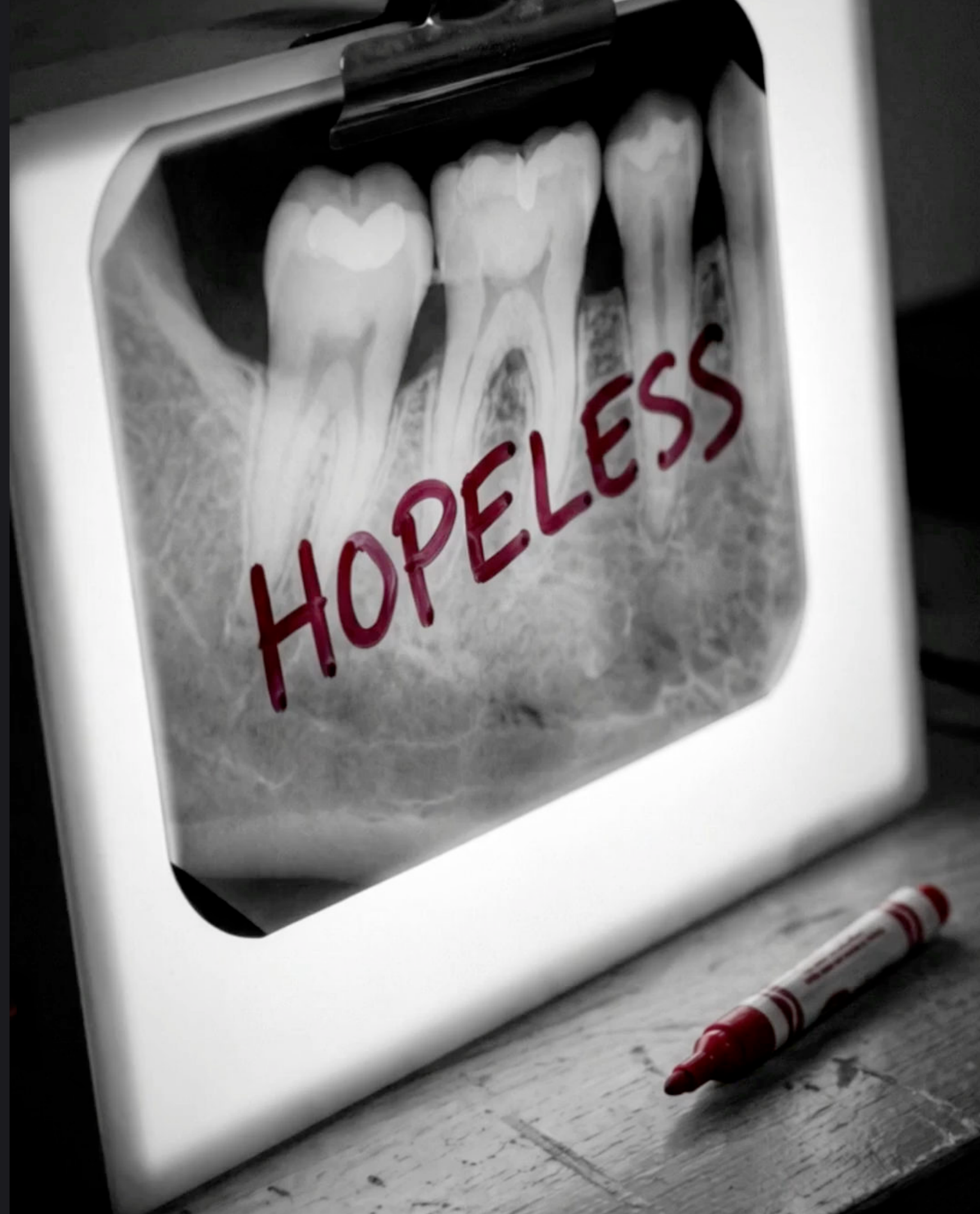
SECTION RECAP

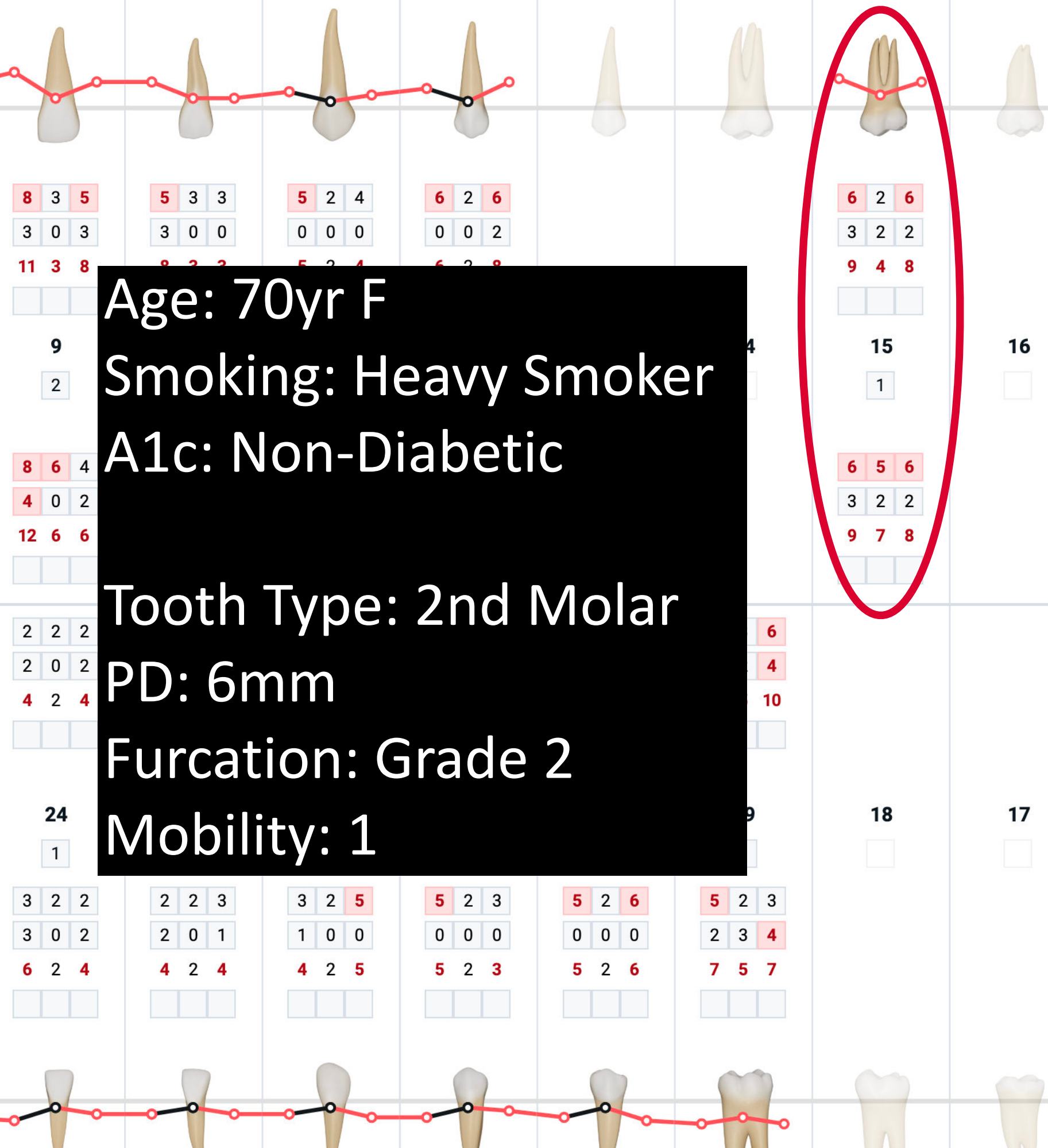
THE SEVEN, BY EFFECT SIZE



Miller-McEntire et al. · Saleh et al. · Emrich et al.

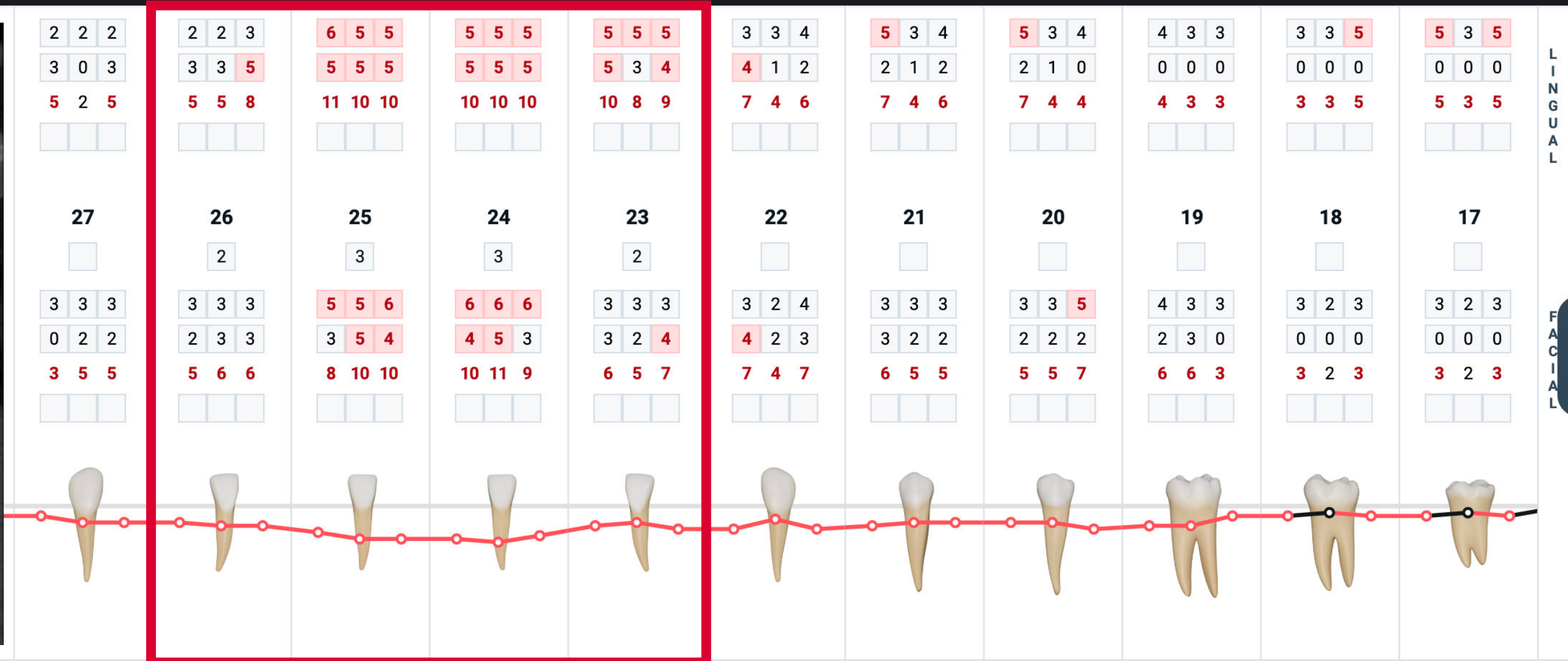
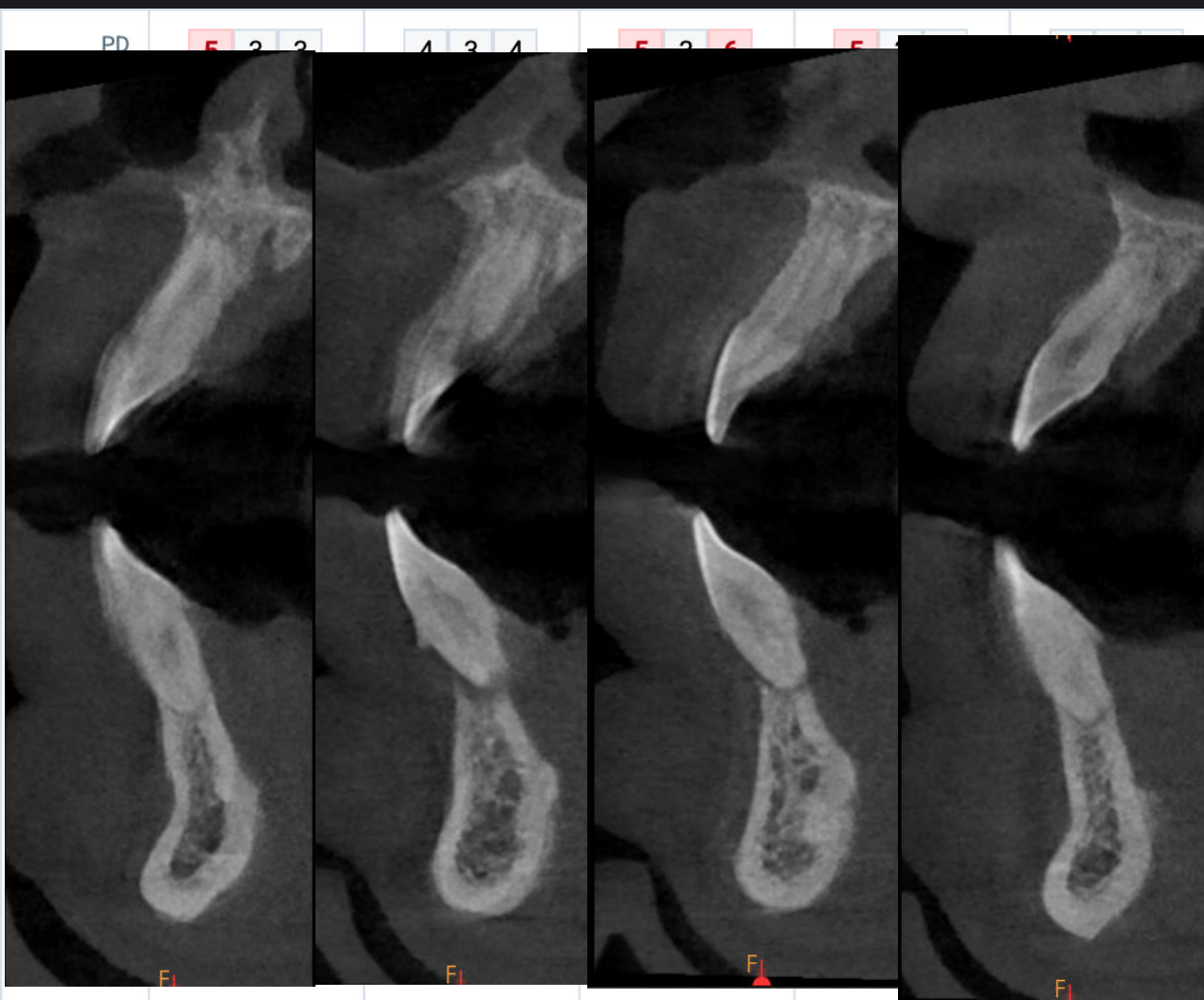
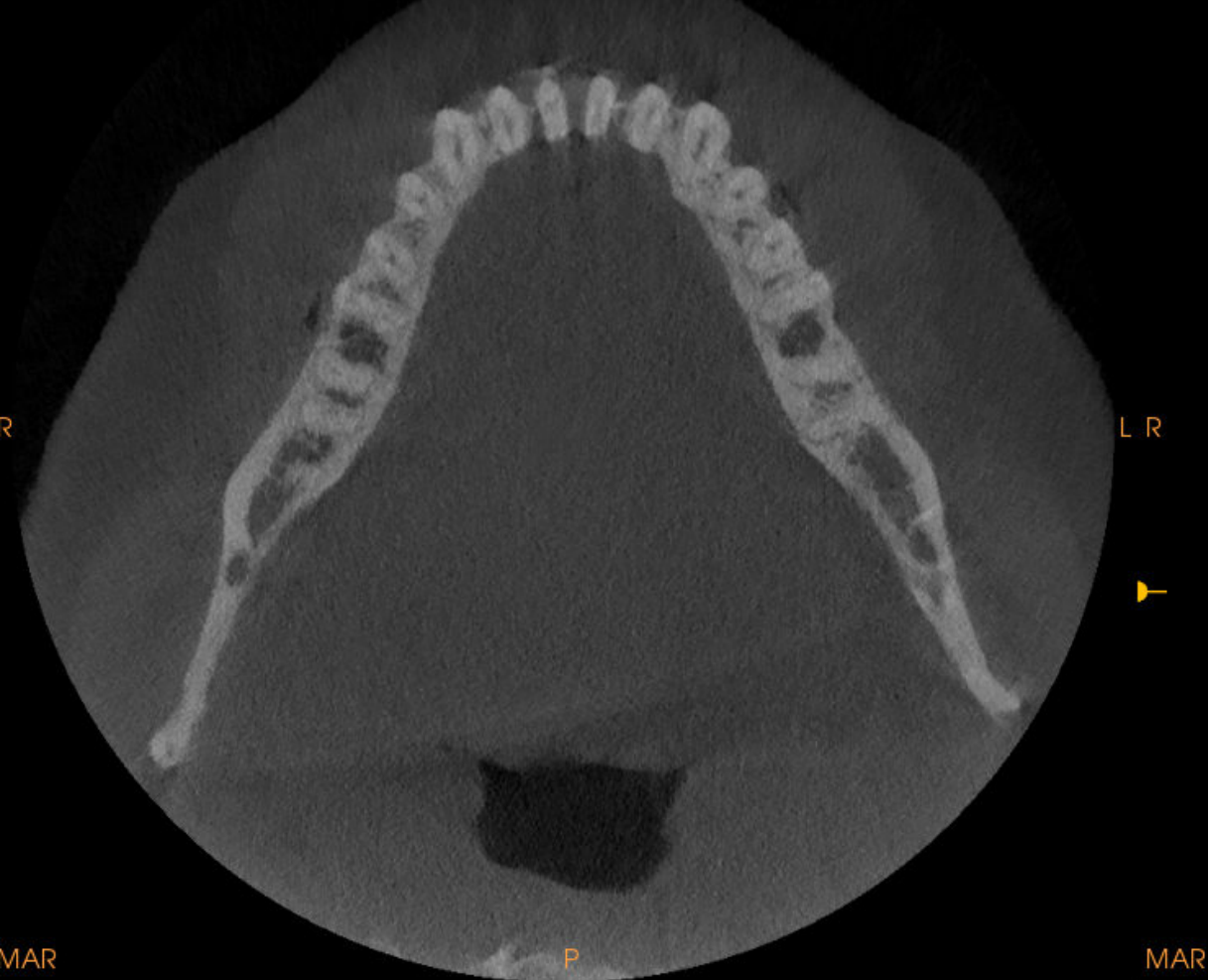






Age: 70yr F
Smoking: Heavy Smoker
A1c: Non-Diabetic

Tooth Type: 2nd Molar
PD: 6mm
Furcation: Grade 2
Mobility: 1





— PART THREE

From Score to Decision

The PRS scores the *tooth*. The decision is made on the **patient** — hygiene, compliance, systemic control, finances, and their wishes.



TRANSLATING THE CLASS INTO ACTION

THREE CLASSES, THREE PLANS

CLASS 1

Excellent

1x

Save and maintain. These teeth reliably survive.

CLASS 2

Good

~3.7x

Save — but with a plan. Control smoking, A1c, home care, then re-evaluate.

CLASS 3

Guarded

~11x

The decision tooth. Heroics are usually borrowed time — extract-and-implant deserves serious discussion.

HR 0.82

Maintenance is the great equalizer — each additional maintenance visit per year independently lowers tooth-loss risk, regardless of class. (Saleh 2023)



MISCH IMPLANT STUDY CLUB

*THE PERIODONTALLY INVOLVED TOOTH AS AN **ABUTMENT***

PROGNOSIS

Will this tooth survive?

DIFFERENT
QUESTION

ABUTMENT CAPACITY

Can it carry a prosthesis?

DOCTRINE VS. EVIDENCE

WHERE THE RULES ACTUALLY CAME FROM

1926 bulletin
articleText-
books100 years of
treatment planning

0

survival
studies

WHAT WE WERE TAUGHT

Ante 1926 — combined PDL area of the abutments should equal or exceed that of the teeth replaced. Source: a state dental society *bulletin*. No patients. No follow-up.

Crown-root ratio — 1:2 ideal · 1:1.5 favorable · 1:1 minimum. Source: *Fundamentals of Fixed Prosthodontics*. Textbook doctrine.

Carried forward by Johnston, Dykema, Tylman, Shillingburg.

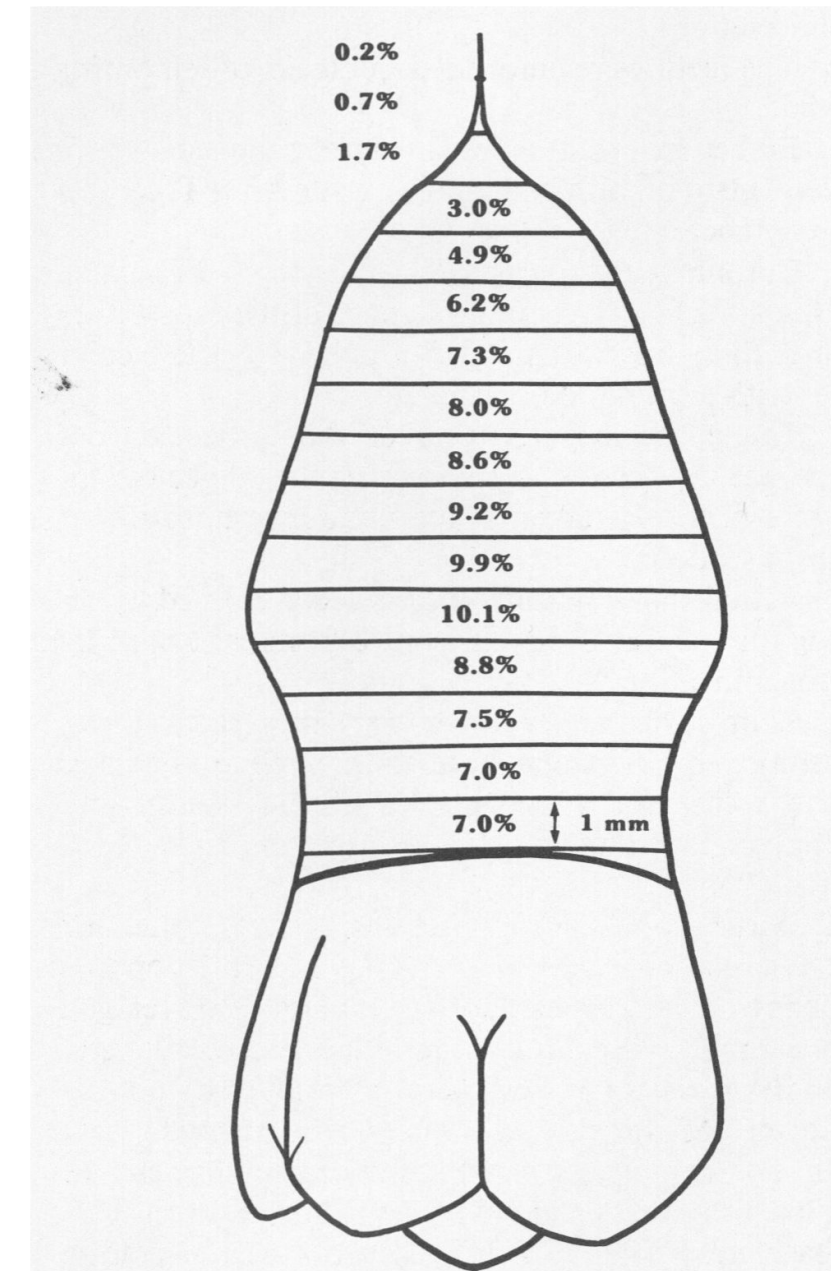


Figure 2. Linear variations of the percentage of root surface area of the maxillary first molar.

Roughly **half the root surface area** sits in the coronal 6 mm of a 13.6 mm root. A linear ratio cannot describe a non-linear structure.

Gher MW, Dunlap RW. Linear variation of the root surface area of the maxillary first molar. *J Periodontol* 1985;56(1):39-43, Figure 2.

DOCTRINE VS. EVIDENCE

WHERE THE RULES ACTUALLY CAME FROM

WHAT WAS ACTUALLY TESTED

McGuire & Nunn 1996 — 100 patients, 5 years, real outcomes: **crown-root ratio did not predict tooth loss**. Mobility, furcation and % bone loss did.

Nyman & Ericsson 1982 — 57% of bridges had abutment PDL area **<50%** of what they replaced. All functional at 8–11 yrs.

Grossmann & Sadan 2005 — “*no definitive recommendations could be ascertained.*”

| What survives of Ante is **distribution**.

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Figure 1.

Survival curves of abutment teeth using Kaplan-Meier method. Abutment teeth were divided into 5 groups according to crown-root ratio (CRR): group A (≤ 0.75), group B (0.76–1.00), group C (1.01–1.25), group D (1.26–1.50), and group E (≥ 1.51).

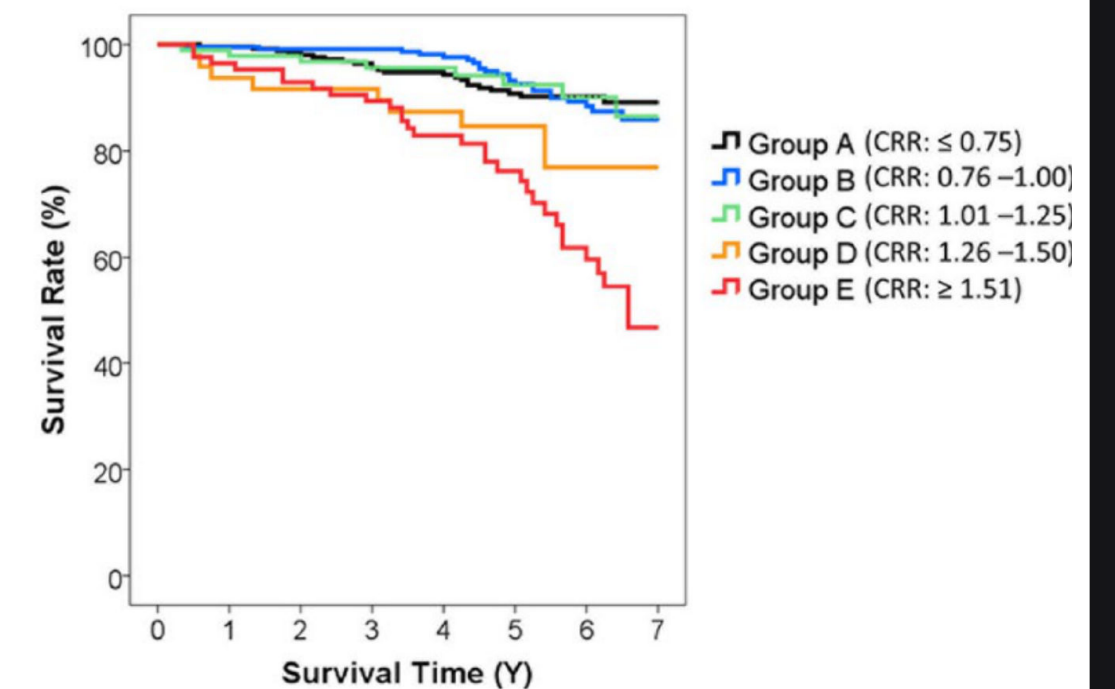


Figure 2.

Relationship of crown-root ratio (CRR) with hazard of tooth loss. Estimates are from

Under a clasp, crown-root ratio **bites** — group E (CRR ≥ 1.51) falls to ~47% at 7 yrs. Rigidly splinted cross-arch, it washes out. It depends on how the tooth is loaded.



THE HONEST CORRECTION

WHICH CASE ARE YOU ACTUALLY IN?

The reassuring literature is almost entirely cross-arch.

CROSS-ARCH / STAGE IV

6–10 abutments

A WEAK ABUTMENT IS...

carried by the others

EVIDENCE BASE

Nyman · Laurell · Yi · Lulic · Fardal

BEST AVAILABLE NUMBER

92.9% @ 10 yrs

Lulic — and every included study used *extensive* prostheses.



LOAD DISTRIBUTES AROUND THE ARCH

A cross-arch splint converts individual mobility into collective stability.



THE HONEST CORRECTION

WHICH CASE ARE YOU ACTUALLY IN?

None of it was written about two abutments.

SHORT-SPAN 3-UNIT

2 abutments

A WEAK ABUTMENT IS...

a lever on the strong one

EVIDENCE BASE

essentially absent

BEST AVAILABLE NUMBER

89.1% @ 10 yrs

Tan 2004 — general population, abutment periodontal status *not stratified*.



LOAD TRANSMITS BETWEEN TWO TEETH

20% bone loss rigidly joined to 60%: the firm tooth becomes the fulcrum.



There is no dedicated evidence base for short-span FPDs on periodontally compromised abutments.



01

Periodontal stability

Has the loss stopped?

02

Mobility

Increased-but-stable, or progressive?

03

Furcation

Is there an un-instrumentable reservoir?

04

Restorable & maintainable

Ferrule, endo, caries, access.

05

Compliance

Will the patient show up?

06

Design

Last — and last for a reason.

Boxes 1–3 are judgments about the tooth. Boxes 4–6 are decisions you control.

In a **short span** , boxes 1–3 get stricter and box 6 changes entirely.



THE SIX BOXES

1 Periodontal stability

2 Mobility

3 Furcation

4 Restorable & maintainable

5 Compliance

6 Design

BOX 1

Periodontal *stability* , not periodontal support

WRONG QUESTION

~~How much bone is left?~~

RIGHT QUESTION

Has the loss stopped?

Stability = BOP-negative at that tooth · no residual deep pocket · no progressive attachment loss under maintenance.

Lulic et al. 2007: Long span FPDs on severely compromised dentitions - 5yr survival ~97% - 5–8 yrs, technical failures <8%, no further attachment loss.

SHORT SPAN

No relaxation. Both abutments must clear this box *independently*.



THE SIX BOXES

1 Periodontal stability

2 Mobility

3 Furcation

4 Restorable & maintainable

5 Compliance

6 Design

BOX 2

Mobility — *stable* or *progressive*?

Increased but stable = adaptation to a reduced but healthy attachment → acceptable abutment.

Progressive — increasing across serial visits → not an abutment.

You cannot tell them apart from one reading. You need ≥ 2 time points.

*Mobility is a **direction**, not a number.*

In a 3-unit you are not splinting. You are *coupling*.

SHORT SPAN

Differential mobility between the two abutments is the finding that matters. A grade 2 rigidly joined to a firm tooth makes the firm tooth a fulcrum.



BOX 2 · HOW TO READ IT

Mobility across four visits

Both teeth read grade 2 today. One is an abutment. **One reading cannot tell you which.**

INCREASED BUT STABLE

Flat at grade 2

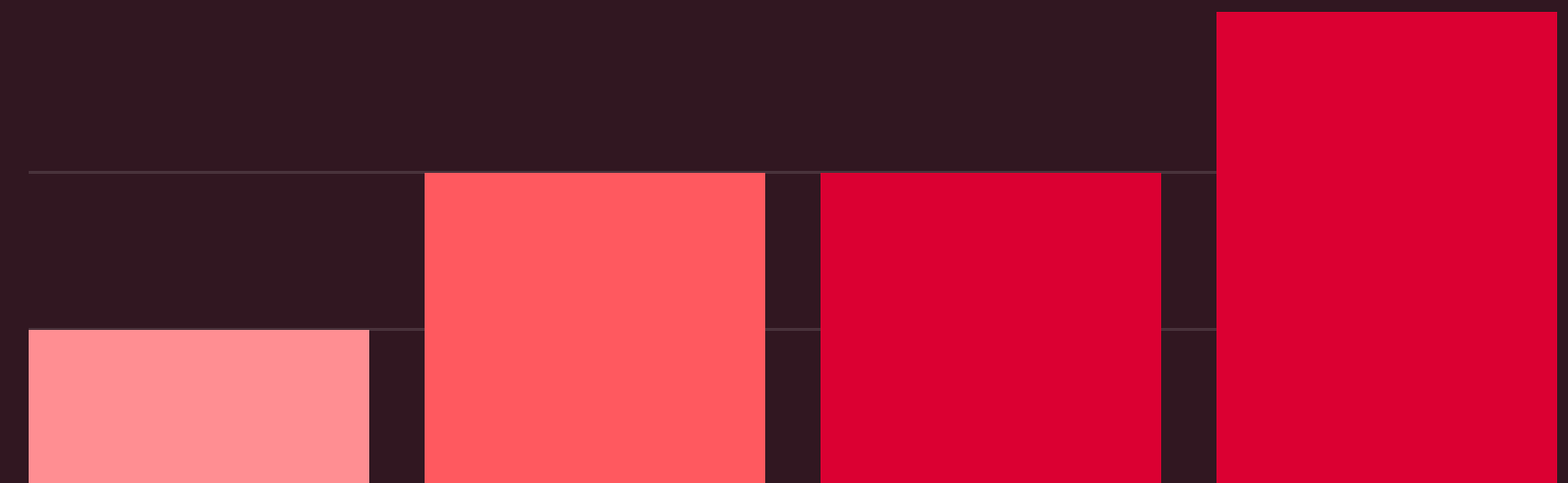


Adaptation to a reduced but healthy attachment — acceptable abutment.

RE-EVAL · 3–6 MO · MAINTENANCE · MAINTENANCE

PROGRESSIVE

Climbing 1 → 2 → 3



The loss has not stopped — not an abutment, in any design.

RE-EVAL · 3–6 MO · MAINTENANCE · MAINTENANCE

Fleszar 1980 — mobile teeth gain less attachment, *but can be successfully maintained*. Chart the direction, not the number.



THE SIX BOXES

1 Periodontal stability

2 Mobility

3 Furcation

4 Restorable & maintainable

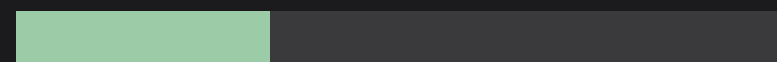
5 Compliance

6 Design

BOX 3

Furcation — the *abutment killer*

A furcation is an un-instrumentable reservoir. Attachment can be stable everywhere else and still fail here. It is an access problem, not a quantity problem.



Class I
Acceptable



Class II
Conditional



Class III
Generally not a terminal abutment

SHORT SPAN

A class II on one of only *two* abutments is a far bigger exposure than the same tooth inside a cross-arch splint.



THE SIX BOXES

1

Periodontal stability

2

Mobility

3

Furcation

4

Restorable & maintainable

5

Compliance

6

Design

BOX 3 · THE VERTICAL COMPONENT

Furcation — bone level matters as much as grade

52.5%

Overall 10-year survival of Class II furcated molars. A coin flip — until you split by the vertical subclass: residual bone on the worst root.

SUBCLASS	RESIDUAL SUPPORT	n	10-YR SURVIVAL		HR vs A
A	coronal third	22		90.9%	ref
B	middle third	100		67%	4.2 (1.1–17.5)
C	apical third	78		23.1%	14.7 (3.6–60.2)

Tonetti MS, Christiansen AL, Cortellini P. *J Clin Periodontol* 2017 — 200 Class II molars, 10 yrs of supportive periodontal care. Wide confidence intervals: small numbers in subclass A.

RECORD IT

When you chart a Class II, chart the vertical component with it.



THE SIX BOXES

1

Periodontal stability

2

Mobility

3

Furcation

4

Restorable &
maintainable

5

Compliance

6

Design

BOX 4

Restorable *and* maintainable

*Caries kills nearly **four times** as many bridges as periodontitis does.*

2.6%

Caries

0.7%

Periodontitis

6.4%

Loss of retention

2.1%

Abutment fracture

Tan 2004 — 10-year risk of losing the FPD, by cause.

04



THE SIX BOXES

1 Periodontal stability

2 Mobility

3 Furcation

4 Restorable & maintainable

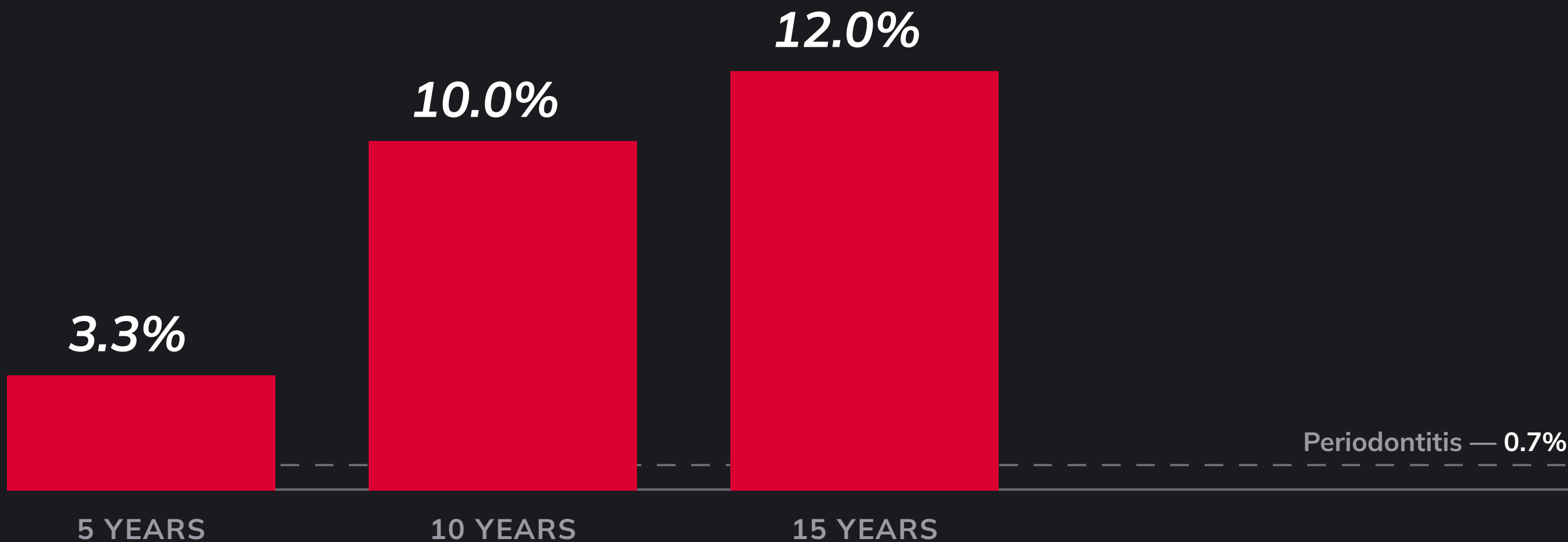
5 Compliance

6 Design

BOX 4 · THE RESTORATIVE COST OVER TIME

Caries on abutment surfaces

Valderhaug 1993 · 15 yrs · 343 abutments vs 525 controls · % of surfaces with caries



Valderhaug 1997 (25 yrs): 30% of vital-pulp abutments and 37% of root-filled abutments failed.

SHORT SPAN

If both abutments are **sound teeth**, a 3-unit converts two healthy teeth into restored teeth. Permanently.



THE SIX BOXES

1

Periodontal stability

2

Mobility

3

Furcation

4

Restorable & maintainable

5

Compliance

6

Design

BOX 5

*The only variable you can change **after cementation***

83.7%



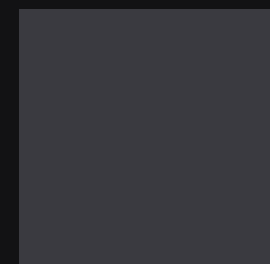
3-6 MONTHS

75.5%



ANNUAL

71.9%



NONE

Tada 2015 — 7-year tooth survival in prosthesis patients, by recall interval. Roughly **12 percentage points** bought by attendance alone.

Fardal 2025: failure predicted by poor oral hygiene ($p = 0.0093$) and complications during maintenance ($p = 0.0059$).

Same prosthesis. Different program.

CONSENT

If the patient will not commit to 3-6 month maintenance, you are planning a **different case**.



THE SIX BOXES

1 Periodontal stability

2 Mobility

3 Furcation

4 Restorable & maintainable

5 Compliance

6 Design

Design optimizes a viable abutment. It does not create one.

BOX 6 · LAST, AND LAST FOR A REASON

Design

CROSS-ARCH / STAGE IV

Rigid cross-arch splinting · stable ICP · controlled excursions · cleansable embrasures.

Cantilevers acceptable in selected cases — Laurell 1991: 33/36 zero complications.

Yi 1995: over ~15 yrs, design and initial support did not predict change.

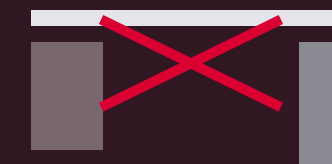


SHORT SPAN

No evidence that adding a secondary or double abutment helps. It adds a third tooth to the caries, endo and connector risk pool.

The real design question in a short span is not *how to build the bridge*. It is **whether to build one**.

Adding abutments is not a strategy. It's a hope.



77.8%

Implant-to-tooth survival at 10 yrs — the worst design in the literature



THE THRESHOLD SLIDE

How mobile is *too mobile*?

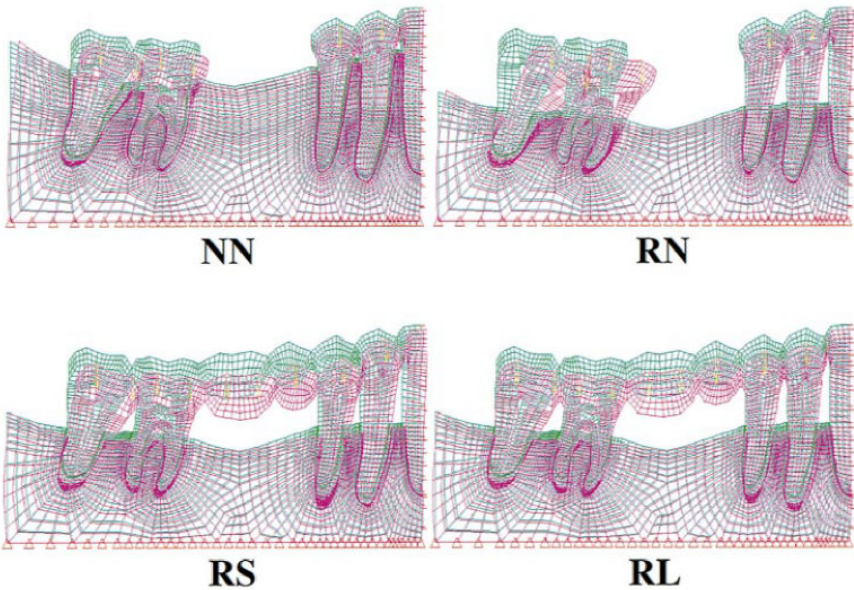


Fig. 3. Deflection after loading. Green lines indicate outline before loading. Red lines show contour after loading. Magnitude of displacement is x50. In freestanding molar, there is greater mesial deflection in reduced bone support (RN) than models with normal bone support (NN). Marked reduction of mobility is observed when FPD replaced missing space. Little difference of deflection is observed in vertical direction between models with 4-unit FPD (RS) and 6-unit FPD (RL), whereas significant difference is found in mesial direction.

Yang HS, Lang LA, Felton DA. Finite element stress analysis on the effect of splinting in fixed partial dentures. *J Prosthet Dent* 1999;81(6):721–728, Figure 3. Deflection x50; green before loading, red after.

No validated threshold exists. No clinical study anywhere reports FPD survival stratified by abutment mobility grade. Everything on this slide is a *model study* — mechanism, not outcome data.

	2-ABUTMENT FPD	CROSS-ARCH SPLINT (≥4)
Mobility — differential	≤1 grade between the two	Less critical — the splint absorbs it
Mobility — absolute	Grade 2 OK <i>if matched, stable, occlusion controlled.</i> Any vertical / depressible component = no	Grade 2–3 OK as a secondary , never terminal
PRS class	Class 1 · Class 2 with disclosure · Class 3 = no	Class 3 as a secondary only
PRS 15–20 yr survival	96% Class 1 90% Class 2 67% Class 3 Saleh 2022 · 6,762 teeth	
Furcation	Class 0–I	Class II acceptable
Bone levels	Comparable between abutments	May vary
Progressive mobility	Disqualifies — every design, every span. The only line that does not move.	
Geramy 2010 — “splinting a very weak abutment to an adjacent healthy tooth might not be beneficial.”		



TAKE-HOME

*STABILITY, NOT SUPPORT. AND **SPAN**, NOT JUST TOOTH.*

The tooth doesn't need to be strong. It needs to be stable, cleanable, and not asked to work alone.

Boxes 1–3 decide *whether*. Boxes 4–6 decide *how*.

The cross-arch evidence is reassuring. It does not transfer to two abutments.

Re-score at maintenance. The prosthesis won't tell you the tooth is failing — the chart will.

*Ante told us to count. The evidence tells us to look — and to ask **how many teeth are sharing the load.***



PART FOUR

When the Tooth Goes

Walk the patient up the replacement ladder — and weigh each rung on its merits. For the appropriate patient, the implant is the ideal replacement.



WEIGH EVERY RUNG ON ITS MERITS

THE REPLACEMENT LADDER

Do nothing

~50%

ridge width lost in 3 mo; 92% supra-erupt. Not neutral.

Tooth heroics

88→68%

crown-lengthening survival 5→15 yr. Resets the clock, doesn't stop it.

RPD

56%

abutment survival (vs 81%); 40–65% stop wearing it.

FPD / bridge

~15%

of abutments need RCT (vs ~3%). Survival ties — biologic price doesn't.

Dental implant

96.8%

10-yr survival — without preparing or loading the neighbors, and it preserves bone.

Every alternative either **damages the dentition, fails to preserve bone, or merely delays the extraction**. The implant restores function, preserves bone, and leaves the neighbors untouched.



01 Do nothing

02 Heroics

03 RPD

04 FPD

05 Implant

RUNG 01

DO NOTHING

Not neutral

Doing nothing is a decision — not a default.

The hidden cost of the empty space

Bone collapse

~50% of ridge width lost in 3 months (Schropp 2003) ; a thin plate loses ~7.5 mm vs ~1.1 mm — **7×** (Chappuis 2013).

Drift & eruption

92% of unopposed teeth supra-erupt, ~15° tipping of neighbors (Craddock 2007).

Whole-body cost

Impaired chewing — and tooth loss is linked to shortened lifespan (Kim 2021) .

Be fair — a non-opposed space with no drift risk can be legitimately observed. This one was not.



FROM THE PRACTICE

Site #10 — edentulous for years. The ridge has collapsed and the field has drifted: the cost of "doing nothing."



01 Do nothing

02 Heroics

03 RPD

04 FPD

05 Implant

RUNG 02

TOOTH HEROICS

CROWN LENGTHENING
SURVIVAL

88 → 68%

at 5 → 15 yr. Resets the clock —
doesn't stop it.

Crown Lengthening — Earning a Ferrule

Mandibular anteriors, severe wear, **no sound structure for a ferrule**. Flap + ostectomy re-established biologic width and relocated the margin apically — restorable, not extracted.

Survival 88 / 78 / 68% at 5 / 10 / 15 yr; failures are restorative, not surgical (Ashnagar 2024).

FROM THE PRACTICE · THE CASE IN FOUR STEPS



1 · Before — worn, no ferrule



2 · Ostectomy — structure exposed



3 · Apically positioned + sutured



4 · 6-month finalization

Is the patient looking for the definitive option, or the heroic option?



01 Do nothing

02 Heroics

03 RPD

04 FPD

05 Implant

RUNG 02

TOOTH HEROICS

AUTOTRANSPLANTATION
SURVIVAL

98→83%

at 1 → 10 yr. A living replacement
with its own PDL.

Autotransplantation — A Biologic Restoration

Durable survival

98% at 1 yr · 90% at 5 · **83% at 10** (Chung 2014; Barendregt 2023)

A living PDL

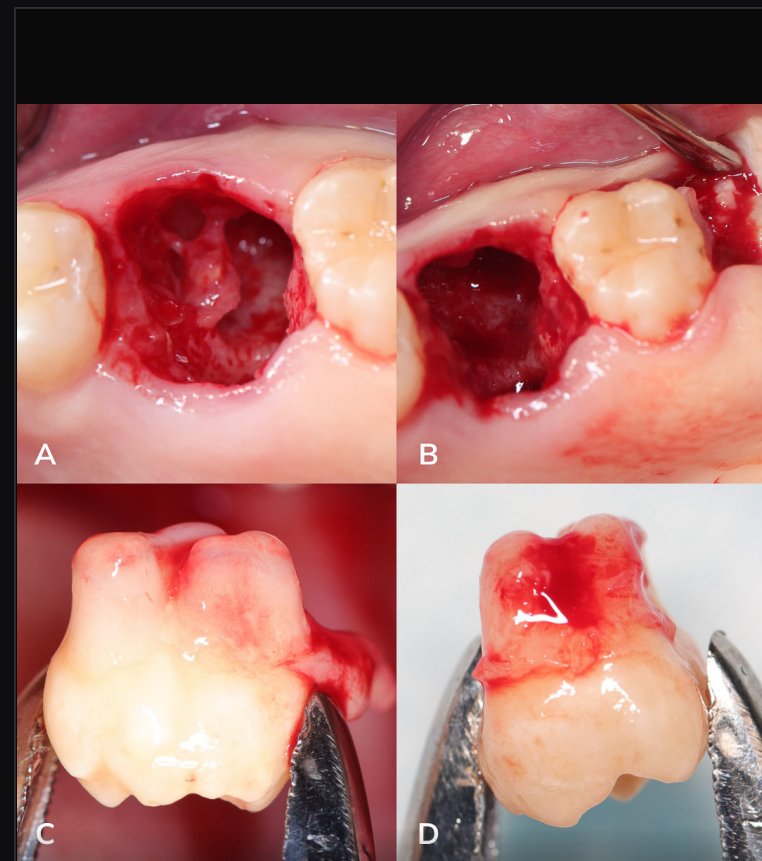
Moves a **vital ligament** — the tooth can erupt, be moved, and induce bone.

Patient selection

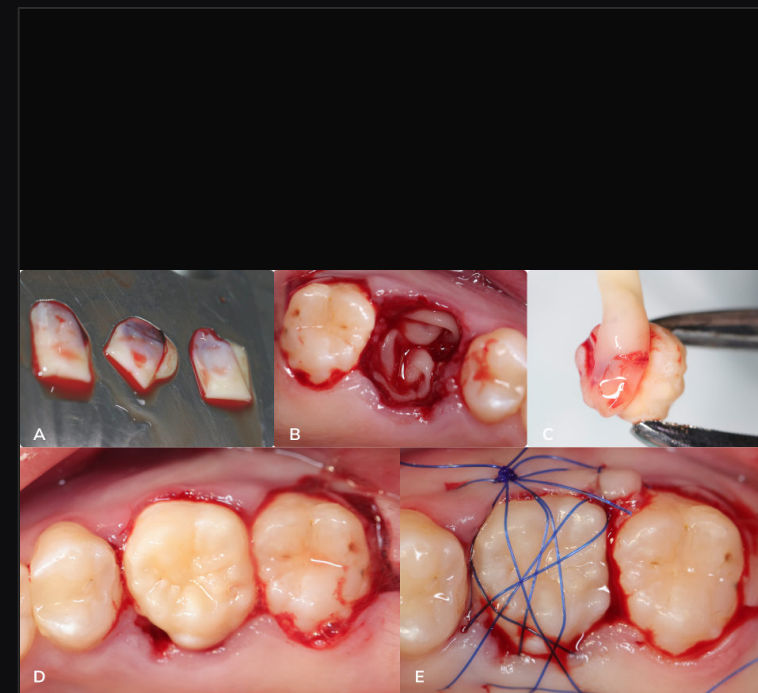
Where a suitable **donor** exists — often a third molar to a hopeless first-molar site.

*A biologic alternative in the right anatomy — but, like all heroics, it **resets the clock, it doesn't stop it.***

THE CASE · MOLAR AUTOTRANSPLANT — SURGERY TO RADIOGRAPHIC FOLLOW-UP



Recipient prepared · donor delivered



Donor seated · sutured to place



Radiographic PDL healing



01 Do nothing

02 Heroics

03 RPD

04 FPD

05 Implant

RUNG 03

REMOVABLE PARTIAL

56%

Abutment survival with an RPD

81%

Abutment survival with **NOTHING**

(Shugars 2001)

The option patients abandon

Harms the remaining teeth

An unrestored space leaves ~81% of teeth intact at 10 yr — but RPD abutment teeth survive only ~**56%** (Shugars 2001).

Patients don't wear them

65% not wearing by 10 yr (Wetherell 1980); 40% by 5 yr (Campbell 2016) — many report eating better without it.

Doesn't preserve bone

Load transmits to the surface only; blood supply drops and the alveolar bone continues to resorb (Gruber 1996) .



01 Do nothing

02 Heroics

03 RPD

04 FPD

05 Implant

RUNG 04

FIXED BRIDGE

~15%

of bridge abutments need root canal —
vs ~3% for a single crown.

Misch's Contemporary Implant Dentistry Vol. 3

Equal survival, higher biologic price

Survival is a near-tie

FPD vs implant **93.8 vs 94.5%** at 5 yr; 89.2 vs 96.8% at 10 yr (Pjetursson 2007).

Complications differ in kind

Bridge — loss of vitality 6.1%, decay 8.1%. **Implant** — BOP 8.6%, >2 mm bone loss 6.3%.

It's not a crown

~80% of bridge abutments were previously untreated teeth (C.E. Misch) . A 3-unit bridge enlists three teeth to fill one space.



01 Do nothing

02 Heroics

03 RPD

04 FPD

05 Implant

RUNG 05

DENTAL IMPLANT

96.8%

10-yr survival — no prep, no load on a single neighbor.

Replaces the tooth without taxing the neighbors

- High, durable survival — no prep, no load on adjacent teeth.
- Preserves bone by restoring functional load to the alveolus.
- Self-contained — a problem doesn't cascade to the dentition.

*For the appropriate patient, the implant is the **ideal replacement**.*

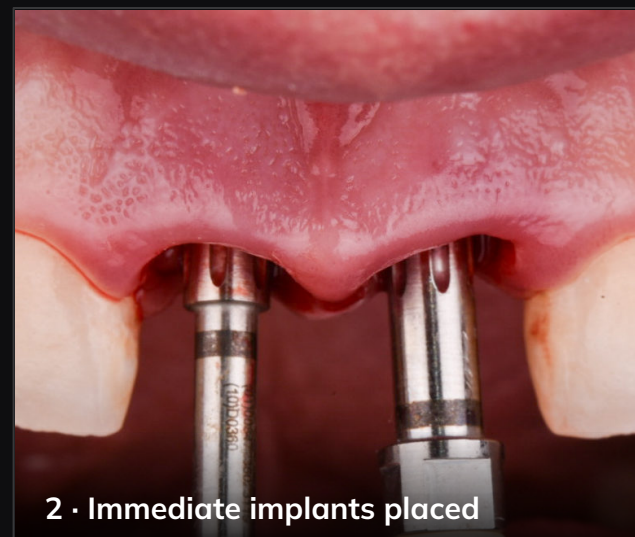


6mo follow up

FROM THE PRACTICE · WESTON — IMMEDIATE IMPLANTS #8, #9 · PRESENTATION → FINAL



1 · Failing incisors



2 · Immediate implants placed



3 · Restorations fabricated



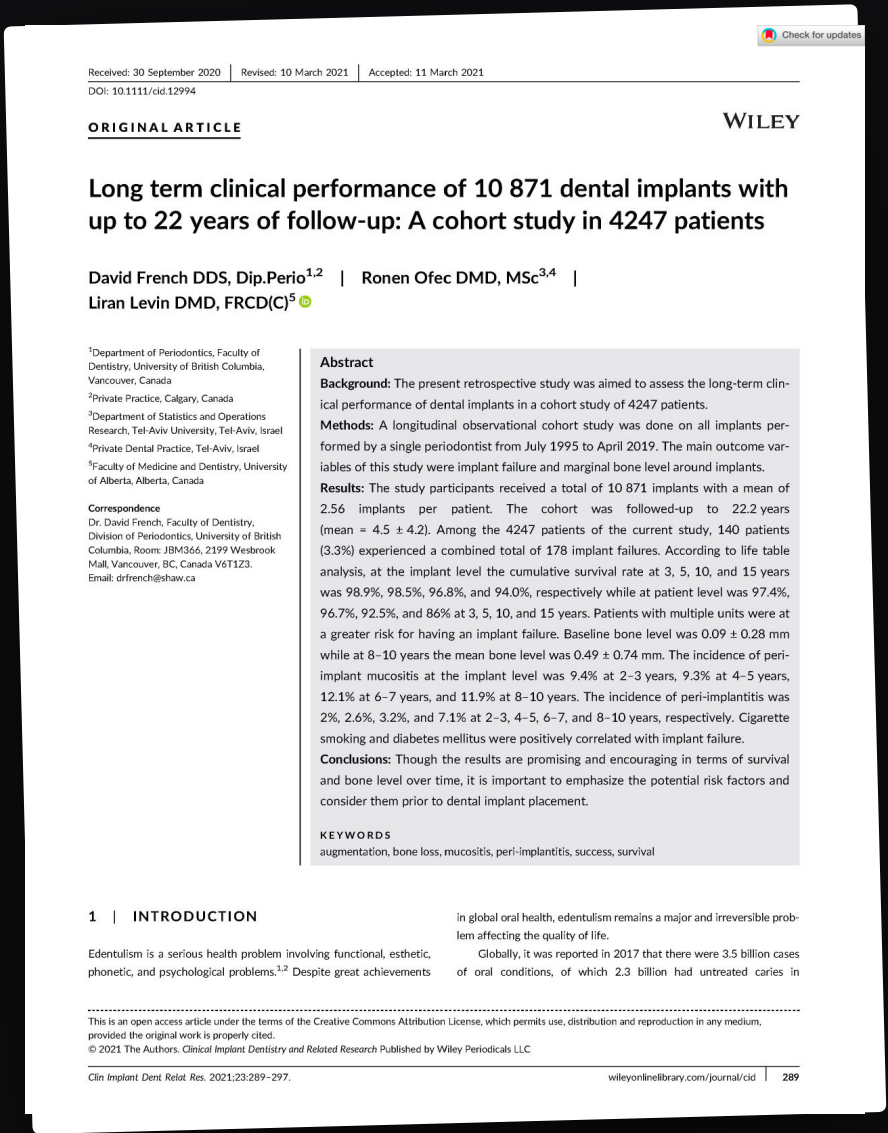
4 · Abutment + crown detail



5 · Immediate Loading + CTG



THE EVIDENCE



French D, Ofec R, Levin L. *Long-term clinical performance of 10,871 dental implants with up to 22 years of follow-up.* Clin Implant Dent Relat Res 2021.

How Long Do Implants Last?

10,871 implants · 4,247 patients · up to 22 years · Cumulative survival at the implant level:



Durable — but **smoking and diabetes** were positively correlated with failure. The same factors that doom a tooth threaten the implant.



FULL CIRCLE — DON'T FORGET THE HOST

*The same factors that doomed the tooth will threaten the **implant** — unless they are managed.*

Smoking, uncontrolled diabetes, poor hygiene and skipped maintenance drive peri-implantitis. An implant is not an escape from periodontal disease — it is a second chance that demands the same discipline.

10–20%

peri-implantitis prevalence — driven by
the same modifiable factors

Koldslund et al. 2010

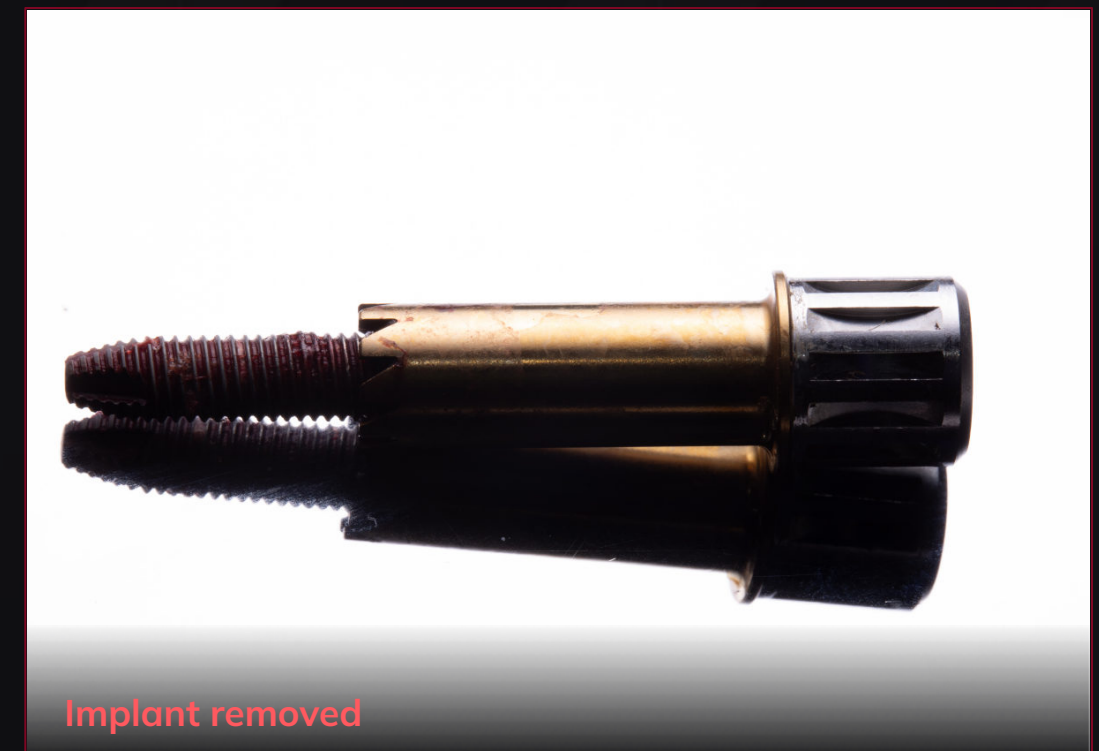
THE SAME DISEASE, ONE IMPLANT — DIAGNOSIS TO EXPLANTATION



Peri-implantitis · exposed threads



Reverse-torque removal



Implant removed



THE BOTTOM LINE

*Score the tooth. Save what responds.
Replace what won't.*

For the Guarded tooth that won't respond — in a patient who can support it — extract and place an implant: the only replacement that preserves bone and spares the neighbors. Then control the modifiable factors, because they decide the fate of the implant just as they decided the fate of the tooth.



KEY CITATIONS & DATA POINTS

REFERENCES

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Miller-McEntire 2014; Saleh 2021. MMPPI; external validation of 10 systems. — first to weight systemic factors.

Hirschfeld & Wasserman 1978. Tooth loss in 600 treated patients. *J Periodontol* 49:225. — molars lost most; 31% of furcation teeth lost.

Ravidà et al. 2020. Dose-dependent effect of smoking and smoking cessation on periodontitis-related tooth loss. *J Clin Periodontol* 47:1132–43. — washout ≈ 15 yr in periodontitis patients; risk –6%/yr.

Salvi et al. 2014. Furcation involvement & tooth loss. *J Clin Periodontol* 41:701. — FI-2 2.9×, FI-3 6.9×; FI-1 not a risk.

Pjetursson et al. 2007; Shugars 2001; Koldslund 2010. FPD vs implant; RPD outcomes; peri-implantitis. — ladder & full-circle data.

Agudio et al. 2023. Longevity of teeth: 30 years of supportive care. *J Clin Periodontol* 50:520. — 5.1% lost; age, molar, PD, mobility predictors.

McGuire & Nunn 1996. Prognosis vs actual outcome. *J Periodontol*. — accurate for "Good," unreliable below it.

Tomar & Asma 2000. Smoking-attributable periodontitis, NHANES III. *J Periodontol* 71:743. — OR 3.97; 41.9% attributable.

Emrich, Shlossman & Genco 1991. Periodontal disease in NIDDM (Pima). *J Periodontol* 62:123. — OR 2.81 / 3.43, independent.

Matuliene et al. 2008. Residual pockets, progression & tooth loss. *J Clin Periodontol* 35:685. — 6 mm ~11×, ≥7 mm ~64×.

French, Ofec & Levin 2021. Long-term clinical performance of 10,871 dental implants with up to 22 years of follow-up. *Clin Implant Dent Relat Res* 23(3):289–97. — 96.8% at 10 yr; smoking & diabetes correlate with failure.