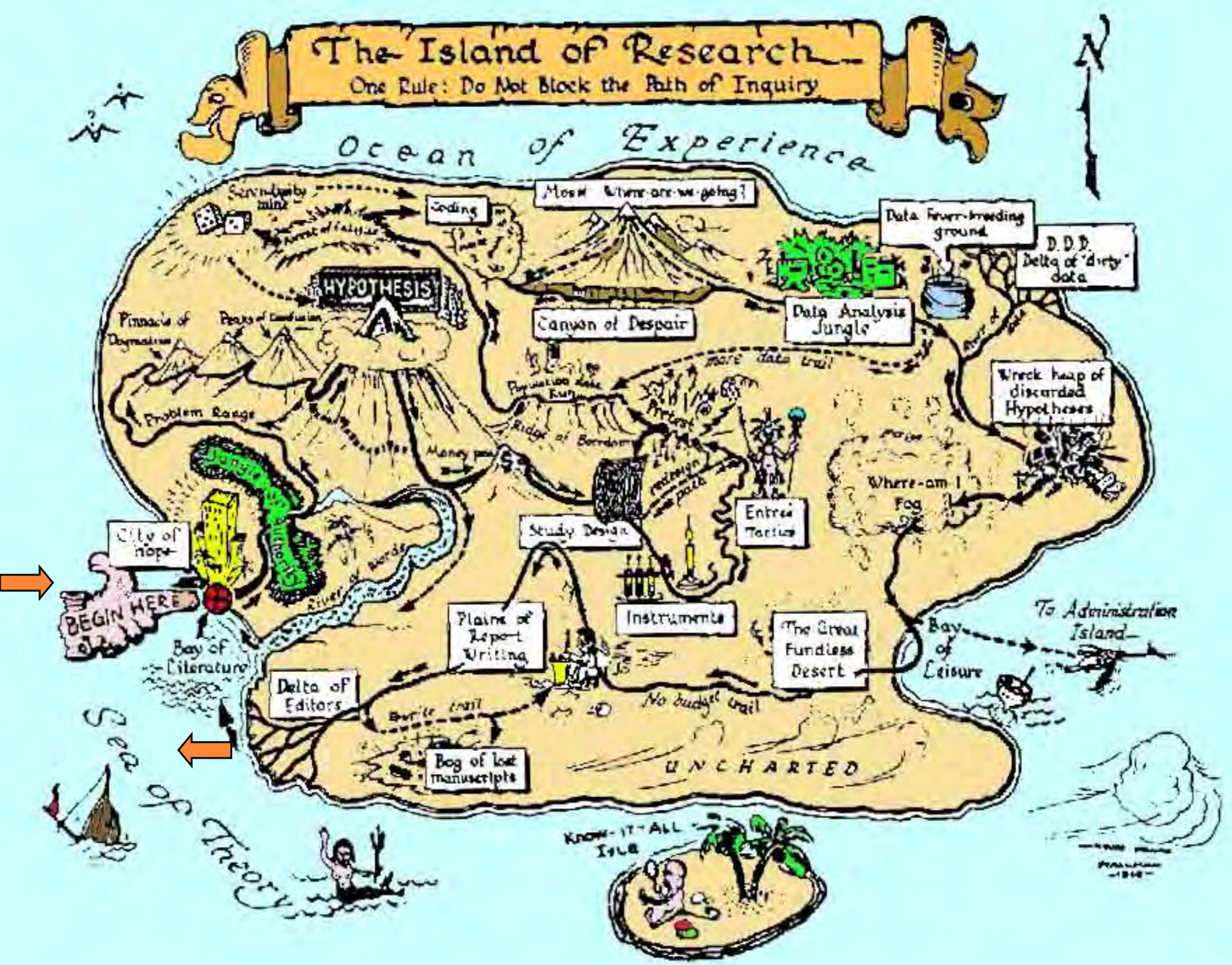
Metodología y diseños en investigación cuantitativa

Prof. Dra Marcela Hernández Ríos

Método científico

"Aplicación del sentido común organizado"

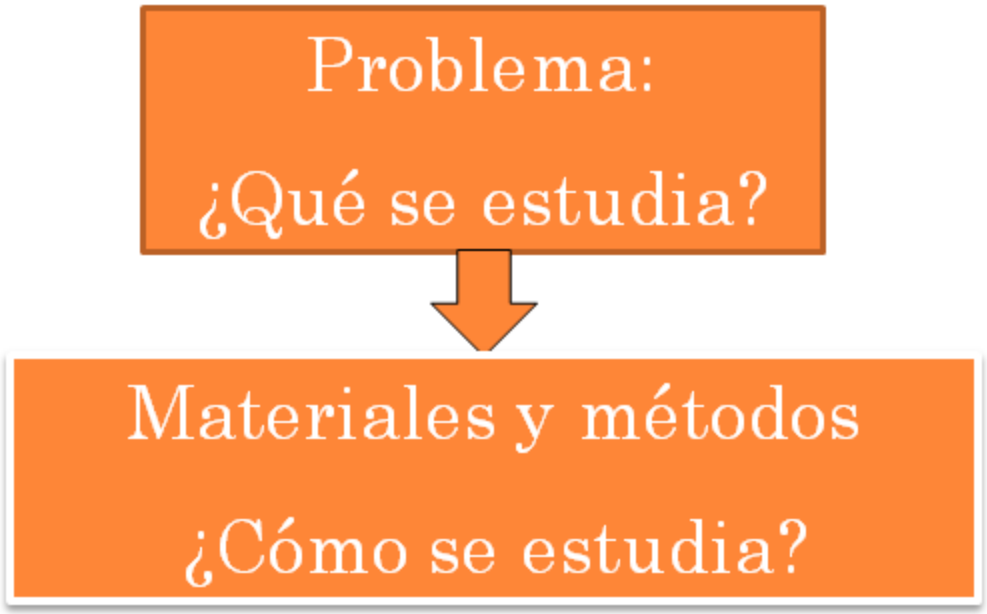
Marcela Hernández Ríos



Marcela Hernández Ríos

Método científico

Diseño metodológico



- Estrategias y procedimientos que seguirán para dar respuesta al problema y comprobar la hipótesis
- Plan de acción del investigador para alcanzar objetivos

“El objetivo de un método es llegar a no tenerlo”

Dra. Marcela Hernández Ríos

Objetivos del diseño metodológico

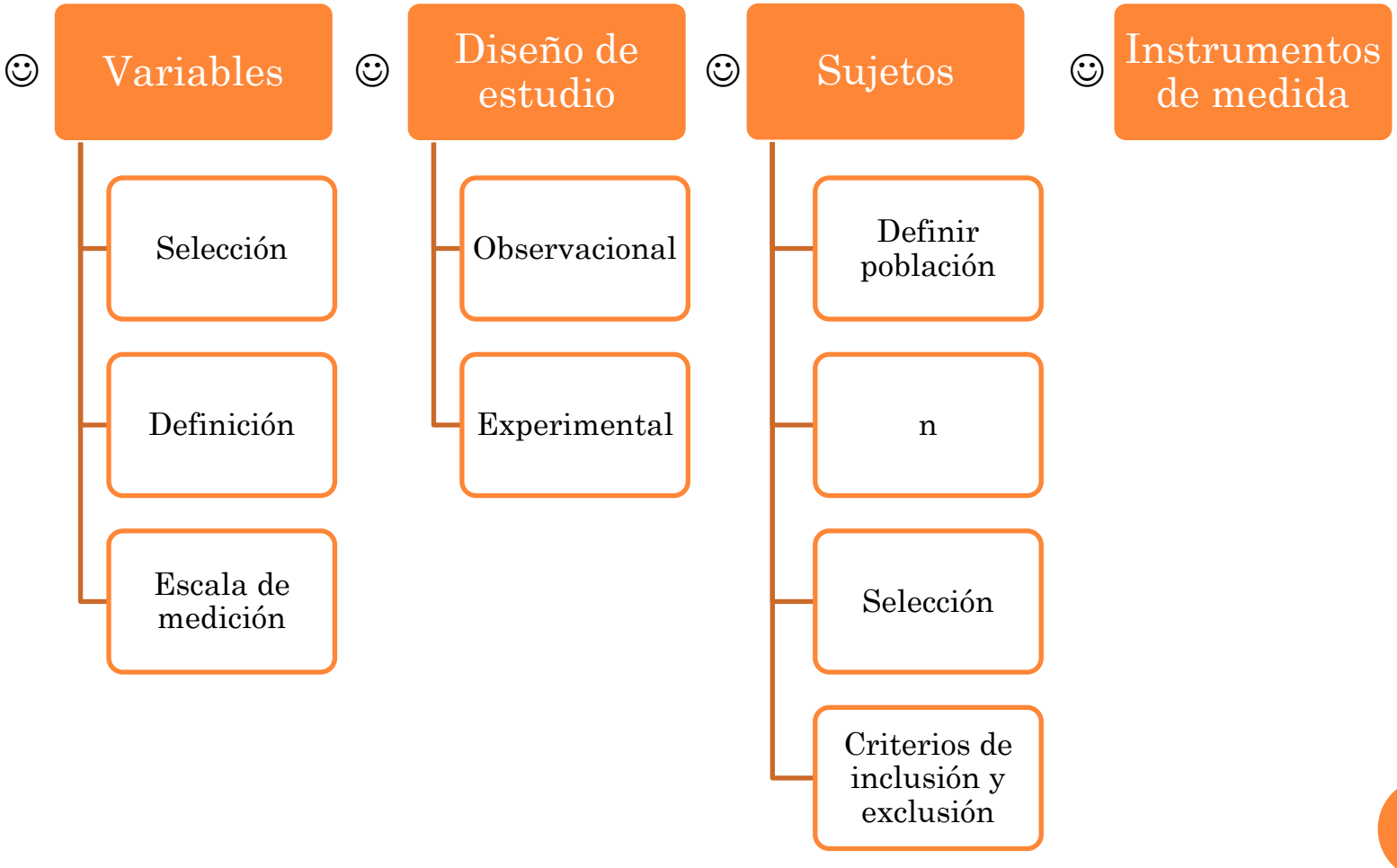
- Maximizar confiabilidad y validez de los resultados

- **Confiabilidad:**
- Consistencia, Coherencia, Estabilidad de la info.
- *Reproducibles

Objetivos del diseño metodológico

- **Validez:**
- Grado en que se mide lo que se intenta medir
- Requisito para lograr confiabilidad
- Un dato puede ser confiable, pero no válido

Planificación y metodología



Variables


Cada una de las características o aspectos medidos en los sujetos estudiados
Medir: asignar valores dentro de una escala

Variables: escalas de medición

Cuantitativa

Ordinal

Nominal

Operacionalización de variables

- Transformar una variable abstracta en observable y medible
- Explicar cómo se miden

Variable (teórica)

Operacionalización

-Definición conceptual

Indicador(es) (V empírica)

Variables según escalas

Nominal (cualitativas)	Ordinal	Cuantitativas
◆Sin orden ◆Propiedades ◆Dicotómicas ◆Valor asignado arbitrario y excluyente	◆Con Orden ◆Falta de proporcionalidad ◆Valor según intensidad de la característica	◆Orden numérico ◆Distribuidos en escala ◆Discretas: números enteros ◆Continuas: escala numérica

Conversión de escala

EJEMPLOS

Table 1. Clinical parameters of periodontitis patients and controls

	Periodontitis ($n = 27$)	Controls ($n = 9$)
Age (years)	45.86 ± 7.69	45.38 ± 7.74
Females	72.72	66.66
Probing depth (mm)	3.44 ± 0.68*	1.98 ± 0.41*
Attachment level (mm)	3.98 ± 0.50†	0.62 ± 0.35†
% sites with plaque	60.40‡	18.10‡
% sites with bleeding on probing	45.40§	8.44§

Values are expressed as means ± SD.
*Mean probing depth. Periodontitis *versus* control: $p = 0.002$.
†Mean attachment level. Periodontitis *versus* control: $p = 0.001$.
‡% Sites with plaque. Periodontitis *versus* control: $p = 0.0005$.
§% Sites with bleeding on probing. Periodontitis *versus* control: $p = 0.007$.

Hernández M, Martínez B, Tejerina JM, Valenzuela MA, Gamonal J. J Clin Periodontol. 2007 Sep;34(9):729-35.

Table 2 Comparison of two series of nonendodontic periapical lesions

Histologic diagnosis	Present study (2007) (Chile), *n* (%)	Kuc *et al.* (2000) (Canada), *n* (%)
Keratocystic odontogenic tumour	11 (0.27)	0 (0)
Chronic sinusitis	3 (0.07)	0 (0)
Central giant cell granulomas	3 (0.07)	2 (0.25)
Nasopalatine duct cyst	1 (0.02)	1 (0.2)
Calcifying cyst odontogenic tumour	1 (0.02)	0 (0)
Foreign body granuloma	1 (0.02)	0 (0)
Periodontal lateral cyst	1 (0.02)	1 (0.12)
Ameloblastic fibroma	1 (0.02)	0 (0)
Haemangioma	1 (0.02)	0 (0)
Amalgam tattoo	1 (0.02)	0 (0)
Cemental dysplasia periapical	1 (0.02)	0 (0)
Squamous odontogenic tumour	1 (0.02)	0 (0)
Fibro-osseous lesion	0 (0)	1 (0.12)
Calcifying epithelial odontogenic tumour	0 (0)	1 (0.12)
Myxoma odontogenic	0 (0)	1 (0.12)
Multiple myeloma	0 (0)	1 (0.12)
Total	26 (0.65)	8 (1)

Ortega A, Fariña V, Gallardo A, Espinoza I, Acosta S. Int Endod J. 2007 May;40(5):386-90.

Variable: Higiene oral

Criterios clínicos para el índice de placa de Löe y Silness	
Grado	Características
0	No hay placa
1	No hay placa a simple vista. Hay placa cuando se realiza el pasaje de sonda ó explorador por el área dentogingival
2	Hay placa bacteriana a simple vista
3	Hay placa bacteriana a simple vista rodeando el diente, incluso por espacios interdentales. Puede haber cálculos.

Variables según relevancia

Variable independiente	Variable dependiente
•Causa •Factor de riesgo •Predictor •Explicativa •Covariable	•Efecto •Respuesta •Resultado •Criterio

Asociación entre variables: Hipótesis

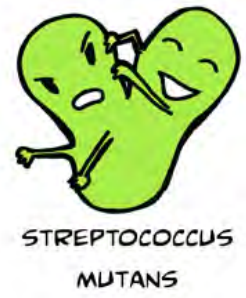
- Tipos:
- Asociación o covariación
  - Variación de x modifica directa o inversamente a y
- Relación de producción
  - X influye o produce cambio en y
- Relación causal
  - Explica y predice fenómenos

- >x>y
- >x<y
- <x<y
- <x>y

Variables según relevancia: relación causal

Variable independiente

Variable dependiente



- *Otras*
- *Universales: edad, sexo, educación o clase social*

Ejemplo 1

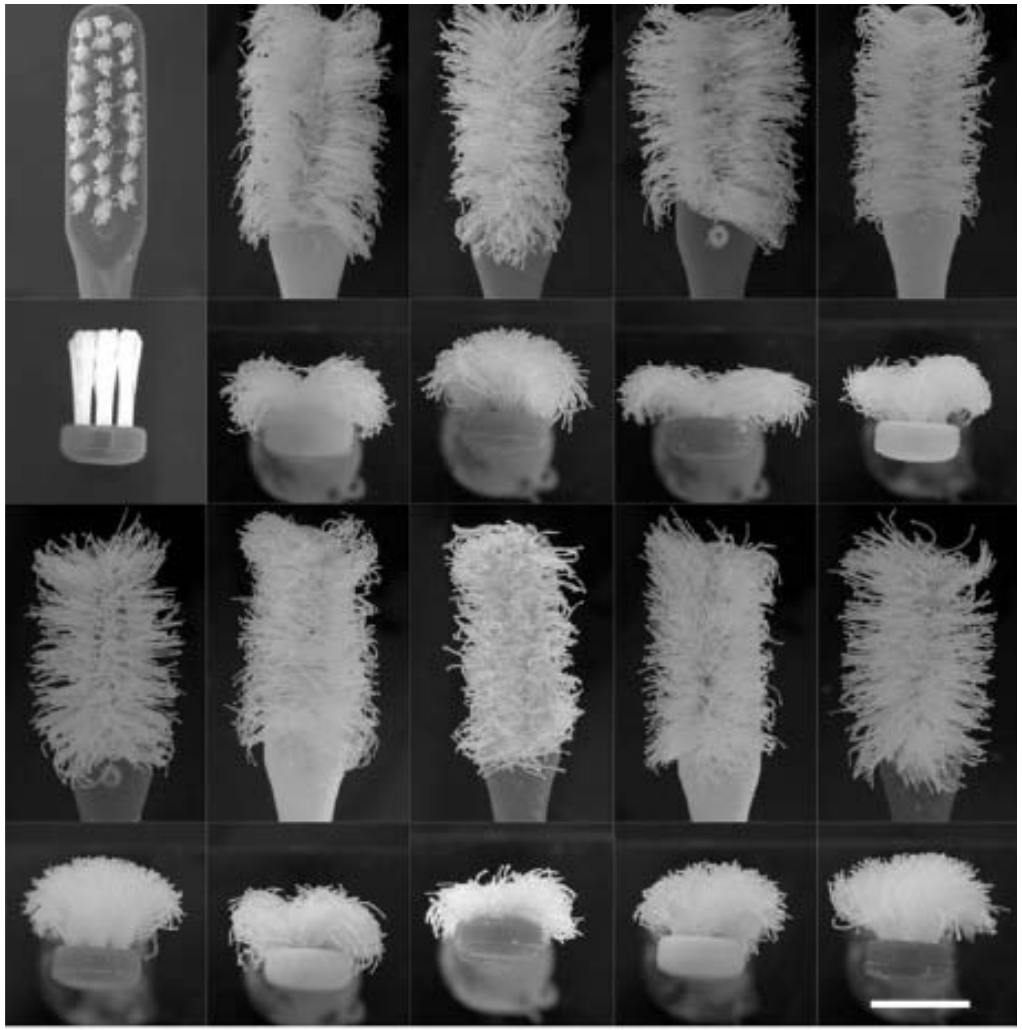


Figure. A new toothbrush and 9 randomly selected 14-month-old toothbrushes. Bar = 1 cm.

Plaque Removal by Young Children Using Old and New Toothbrushes

RESEARCH REPORTS
Clinical

W.H. van Palenstein Helderman[1]*, M.M. Kyaing[2], M.T. Aung[2], W. Soe[2], N.A.M. Rosema[3], G.A. van der Weijden[3],

J Dent Res 85(12):1138-1142, 2006

ABSTRACT

There is inconclusive evidence about the relationship between toothbrush wear and plaque removal. This randomized cross-over clinical trial aimed to validate or invalidate non-inferiority in the plaque-removal efficacy of old *vs.* new toothbrushes in the hands of 7- and 8-year-old children. The lower limit for non-inferiority was

Gelatinolytic activity in gingival crevicular fluid from teeth with periapical lesions

María José Belmar, DDS,[a] Carolina Pabst, DDS,[a] Benjamin Martínez, DDS, MS,[b] and Marcela Hernández, MD, MS,[b,c] Santiago, Chile
UNIVERSIDAD MAYOR AND UNIVERSIDAD DE CHILE

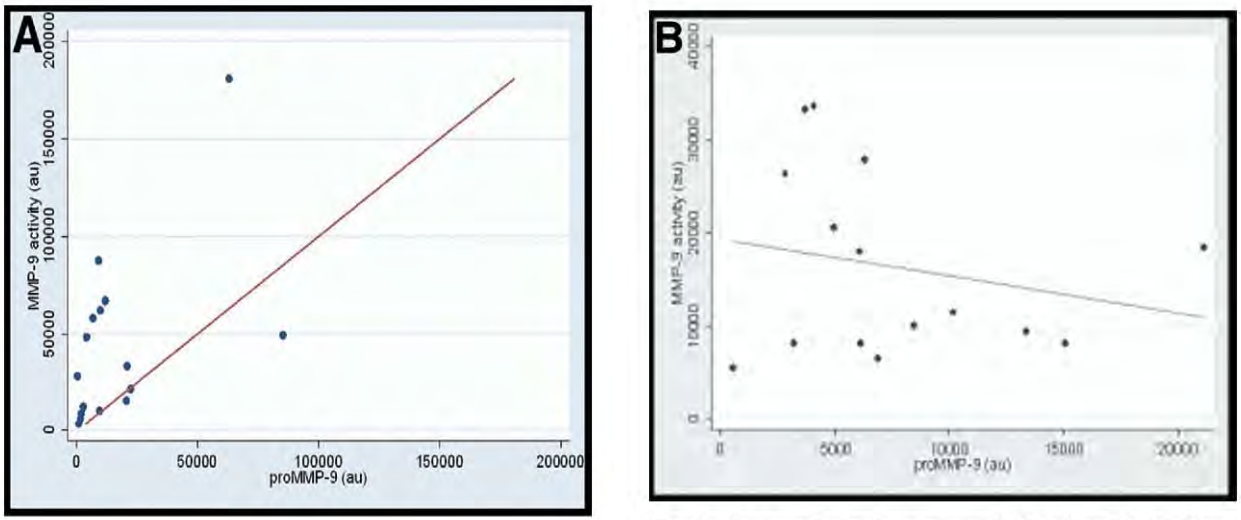


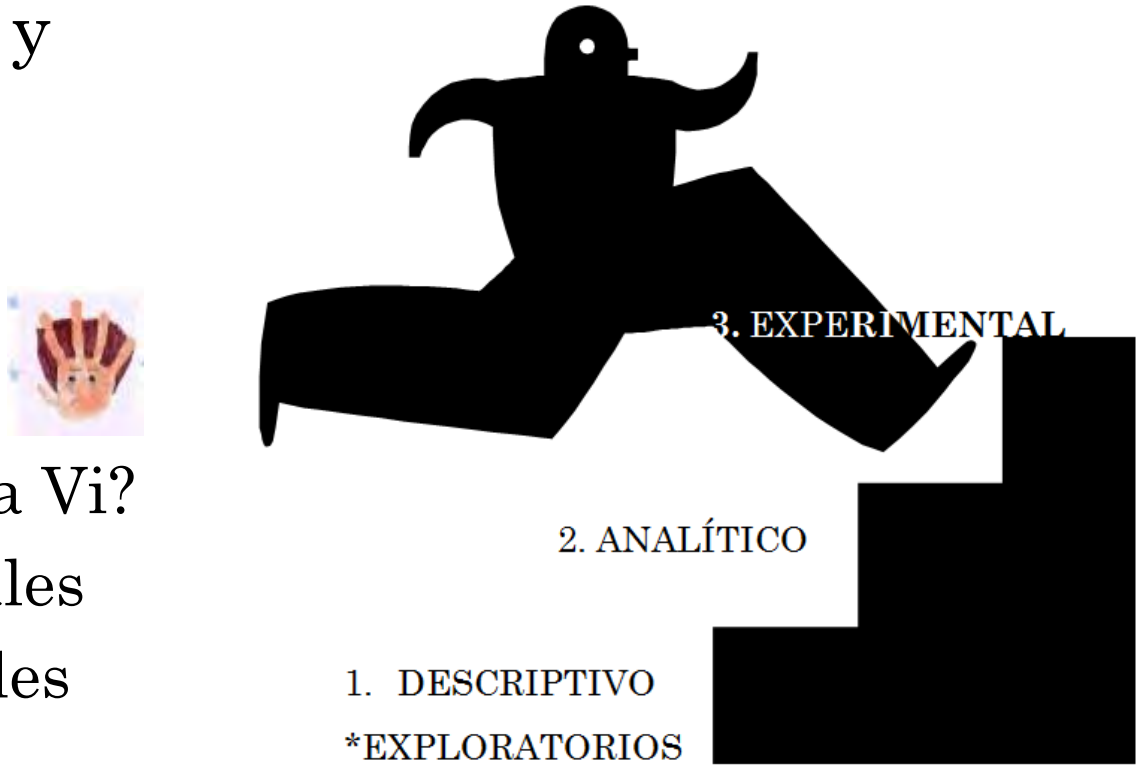
Fig. 2. A, Association between proMMP-9 and MMP-9 activity in GCF from apical lesions. $r = 0.5412$; $p < 0.05$. B, Association betwen proMMP-9 and MMP-9 activity in control GCF. $R = 0.0929$; $p > 0.05$.

Belmar MJ, Pabst C, Martínez B, Hernández M.
Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008 Jun;105(6):801-6.

Tipo de investigación

- Según análisis y alcance de los resultados

- Manipularemos o intervendremos la Vi?
  - -Observacionales
  - -Experimentales



Tipo de investigación

- Según período y mediciones

TRANSVERSAL:

Estudio de variables simultáneamente

Tiempo no es importante

LONGITUDINAL:

Una o más variables a lo largo de un período

> 1 medición

Tiempo sí es importante

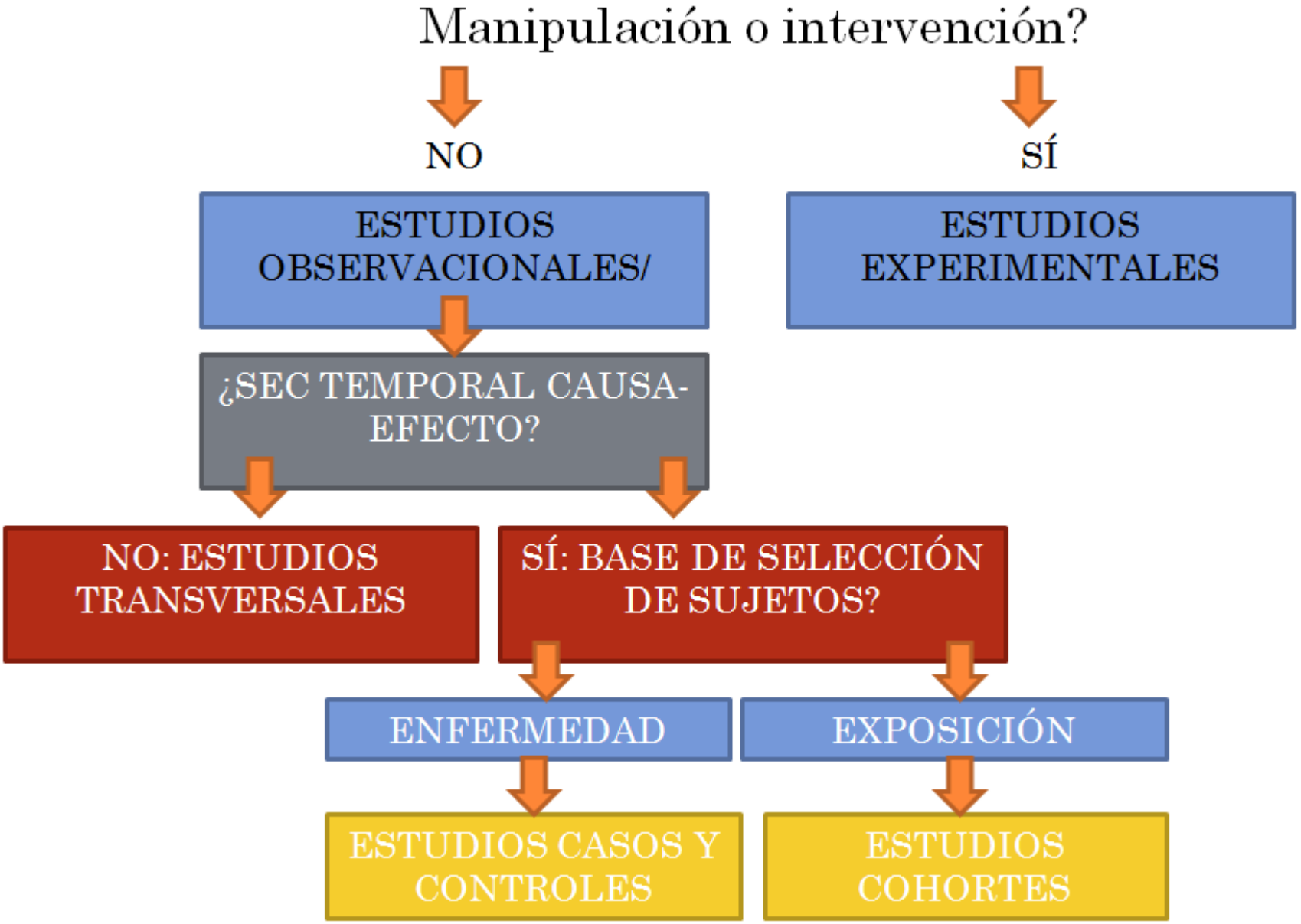
Tipos de investigación en salud

Estudio de las causas de enfermedad

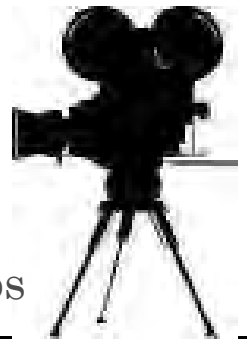
- Observacional
  - Descriptivo
  - Analítico

Evaluación de tratamientos, intervenciones o programas

- Experimental
  - ¡ÉTICA!


Manipulación o intervención?
NO
SÍ
ESTUDIOS OBSERVACIONALES/
ESTUDIOS EXPERIMENTALES
¿SEC TEMPORAL CAUSA-EFECTO?
NO: ESTUDIOS TRANSVERSALES
SÍ: BASE DE SELECCIÓN DE SUJETOS?
ENFERMEDAD
EXPOSICIÓN
ESTUDIOS CASOS Y CONTROLES
ESTUDIOS COHORTES

Descriptivo (Exploratorio)	Analítico o explicativo	Experimental
◆No asocia Vs ◆S/ Hip ◆Estimar frecuencia ◆Caracterizar fenómenos ◆Sugiere asociación Vs	◆Asociación o correlación Vs sin dirección (H_1 ídem) ◆Identificar fact riesgo ◆Sugerir mecanismos de causalidad y preventivos ◆Casos y controles, cohortes	◆Dirección causa-efecto (H_1 ídem) ◆Probar Hip etiológicas ◆Determinar eficacia/efectividad de las intervenciones y fármacos ◆Consideraciones éticas



Proteolytic roles of matrix metalloproteinase (MMP)-13 during progression of chronic periodontitis: initial evidence for MMP-13/MMP-9 activation cascade

Marcela Hernández Ríos[1,2], Timo Sorsa[3], Fabián Obregón[1], Taina Tervahartiala[3], María Antonieta Valenzuela[4], Patricia Pozo[5], Nicolás Dutzan[1], Emmanuel Lesaffre[6,7], Marek Molas[6] and Jorge Gamonal[1]

[1]Periodontal Biology Laboratory, Faculty of Dentistry, University of Chile, Santiago, Chile; [2]Pathology Department, Faculty of Dentistry, University of Chile, Santiago, Chile; [3]Department of Oral and Maxillofacial Diseases, Helsinki University Central Hospital, Institute of Dentistry, University of Helsinki, Helsinki, Finland; [4]Biochemistry and Molecular Biology Department, Faculty of Chemistry and Pharmaceutical Sciences, University of Chile, Santiago, Chile; [5]Faculty of Sciences, Northern Catholic University, Antofagasta, Chile; [6]Department of Biostatistics, Erasmus Medical Centre, Rotterdam, The Netherlands; [7]Biostatistical Centre, Catholic University of Leuven, Leuven, Belgium

Hernández Ríos M, Sorsa T, Obregón F, Tervahartiala T, Valenzuela MA, Pozo P, Dutzan N, Lesaffre E, Molas M, Gamonal J. Proteolytic roles of matrix metalloproteinases (MMP)-13 during progression of chronic periodontitis: initial evidence for MMP-13/MMP-9 activation cascade. J Clin Periodontol 2009; 36: 1011–1017. doi: 10.1111/j.1600-051X.2009.01488.x.

Abstract

Aim: Matrix metalloproteinases (MMP)-13 can initiate bone resorption and activate proMMP-9 in vitro, and both these MMPs have been widely implicated in tissue destruction associated with chronic periodontitis. We studied whether MMP-13 activity and TIMP-1 levels in gingival crevicular fluid (GCF) associated with progression of chronic periodontitis assessed clinically and by measuring carboxy-terminal telopeptide of collagen I (ICTP) levels. We additionally addressed whether MMP-13 could potentiate gelatinase activation in diseased gingival tissue.

Materials and Methods: In this prospective study, GCF samples from subjects undergoing clinical progression of chronic periodontitis and healthy controls were screened for ICTP levels, MMP-13 activity and TIMP-1. Diseased gingival explants were cultured, treated or not with MMP-13 with or without adding CL-82198, a synthetic MMP-13 selective inhibitor, and assayed by gelatin zymography and densitometric analysis.

Results: Active sites demonstrated increased ICTP levels and MMP-13 activity ($p<0.05$) in progression subjects. The MMP-9 activation rate was elevated in MMP-13-treated explants ($p<0.05$) and MMP-13 inhibitor prevented MMP-9 activation.

Conclusions: MMP-13 could be implicated in the degradation of soft and hard supporting tissues and proMMP-9 activation during progression of chronic periodontitis. MMP-13 and -9 can potentially form an activation cascade overcoming the protective TIMP-1 shield, which may become useful for diagnostic aims and a target for drug development.

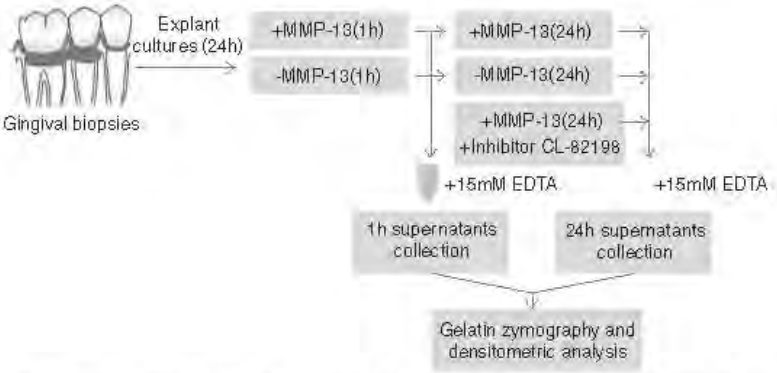
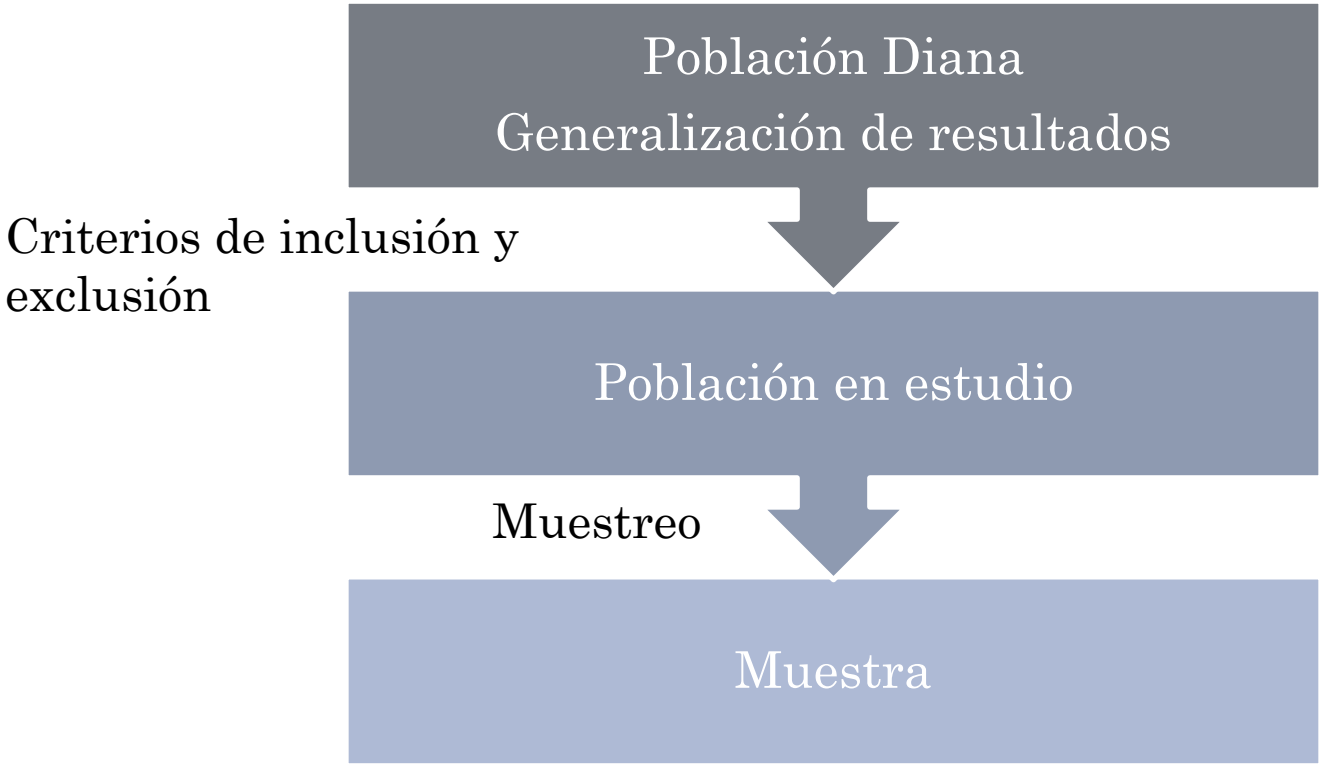


Fig. 1. Diagram representing the sequential steps for diseased gingival tissue preparations.

Key words: chronic periodontitis progression; ICTP; MMP-9; MMP-13

Accepted for publication 30 August 2009

Sujetos


Población Diana
Generalización de resultados
Criterios de inclusión y exclusión
Población en estudio
Muestreo
Muestra

Sujetos

- Todas las características que definirán y delimitarán a los sujetos elegibles

Criterios de inclusión y exclusión

- Todas las características específicas mediante las cuales definimos la enfermedad
- Signos, síntomas, hallazgos Rx, bioquímicos, respuesta a tto.

Criterios diagnósticos

Periodontitis crónica

- Inclusión

Patients

A group of 76 patients were selected from the Center of Diagnostic and Treatment of Northern Metropolitan Health Services, Santiago, Chile, and consecutively enrolled with a diagnosis of moderate to severe chronic periodontitis. The criteria for entry were a minimum of 14 natural teeth, excluding third molars and including at least 10 posterior teeth where five to six had sites with probing depth (PD) $\geqslant 5$ mm with attachment loss $\geqslant 3$ mm and extensive bone loss in radiography, according to a the alveolar crest. Subjects had received no periodontal treatment at the time of clinical examination, they did not suffer from systemic illness and had not received antibiotics or non-steroid anti-inflammatory therapy during the 6-month period before the study. All

Hernández M, Martínez B, Tejerina JM, Valenzuela MA, Gamonal J. MMP-13 and TIMP-1 determinations in progressive chronic periodontitis. J Clin Periodontol 2007; 34: 729–735. doi: 10.1111/j.1600-051X.2007.01107.x.

PERIODONTITIS APICAL

We selected 13 patients consulting at the clinic of diagnosis, School of Dentistry, Universidad Mayor, Santiago, Chile, with one or more periapical lesions detected by periapical radiography due to caries. GCF samples were obtained from around affected teeth and also from healthy equivalent control teeth in each subject, corresponding to the contralateral tooth when possible, or similar tooth from another quadrant. A total of 20 samples and 20 GCF controls were collected. Subjects did not present periodontal diseases or systemic illness and had not received previous antibiotics or nonsteroidal anti-inflammatory drugs during the 6-month period prior to the study. The protocol was clearly explained to all patients and controls, and Institutional Review Board–approved informed consents were signed. Once the patients were diagnosed and samples were taken, they were remitted for endodontic treatment.

María José Belmar, DDS,[a] Carolina Pabst, DDS,[a] Benjamin Martínez, DDS, MS,[b] and Marcela Hernández, MD, MS,[b,c] Santiago, Chile

(Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008;105:801-6)

Tipo de investigación: consideraciones

- Diseño que provee mayor información para responder el problema
- Tipo de problema
- Contexto socio-político, intereses
- Variables y medición
- Tipo de relación entre variables
- Riesgo para sujetos Tiempo
- Recursos disponibles

doi:10.1111/j.1365-2591.2007.01232.x

Nonendodontic periapical lesions: a retrospective study in Chile

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Abstract

Ortega A, Fariña V, Gallardo A, Espinoza I, Acosta S. Nonendodontic periapical lesions: a retrospective study in Chile. *International Endodontic Journal*, **40**, 386–390, 2007.

Aim To determine the frequency with which the histopathological diagnosis of periapical lesions contributes to a change in the clinical diagnosis.

Methodology Cases having a clinical diagnosis of disease resulting from dental pulp necrosis were selected from the database of the Oral Pathology Reference Institute between 1975 and 2005. Cases with different histopathological diagnoses were determined and information about age and gender of the patient, location of associated tooth, pulp status and the histopathological diagnosis were recorded. The percentage of nonendodontic periapical lesions was then determined.

Results In the 30-year period, 43 706 biopsy specimens were received. Overall 4006 (9.13%) had a clinical diagnosis of pulpal necrosis with associated pathosis in the periradicular area. Within this group, 26 cases (0.65%) had a histopathological diagnosis of nonendodontic pathology. Keratocystic odontogenic tumour was the most frequent nonendodontic lesion (11 cases) in the periradicular region followed by central giant cell granuloma (three cases), chronic sinusitis (three cases) and one case each of the following lesions: nasopalatine duct cyst, lateral periodontal cyst, calcifying cystic odontogenic tumour, ameloblastic fibroma, squamous odontogenic tumour, cemental dysplasia, haemangioma, foreign body cell granuloma and amalgam tattoo.

Conclusions The histopathological study of periapical pathosis can occasionally reveal nonendodontic lesions. Odontogenic tumours made up the largest group.

Keywords: keratocystic odontogenic tumour, periapical misdiagnosis, periapical lesions.

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JOURNAL OF PERIODONTAL RESEARCH
doi:10.1111/j.1600-0765.2010.01310.x

Reduced expression of lipopolysaccharide-induced CXC chemokine in *Porphyromonas gingivalis*-induced experimental periodontitis in matrix metalloproteinase-8 null mice

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[1]Laboratory of Periodontal Biology, Faculty of Dentistry, University of Chile, Santiago, Chile, [2]Department of Pathology, Faculty of Dentistry, University of Chile, Santiago, Chile, [3]Department of Diagnostics and Oral Medicine, Institute of Dentistry, University of Oulu, [4]Oulu University Hospital, Oulu, Finland, [5]Department of Oral and Maxillofacial Diseases, Helsinki University Central Hospital, [6]Institute of Dentistry, University of Helsinki, Helsinki, Finland, [7]Institute of Biomedicine/Anatomy, University of Helsinki, Helsinki, Finland and [8]Department of Cariology, Restorative Dentistry and Endodontics, Institute of Dentistry, University of Oulu and Oulu University Hospital, Oulu, Finland

Hernández M, Gamonal J, Salo T, Tervahartiala T, Hukkanen M, Tjäderhane L, Sorsa T. Reduced expression of LIX/CXCL5 in Porphyromonas gingivalis*-induced experimental periodontitis in matrix metalloproteinase-8 null mice. J Periodont Res 2010; doi: 10.1111/j.1600-0765.2010.01310.x.© 2010 John Wiley & Sons A/S*

Background and Objective: Matrix metalloproteinase-8 (MMP-8) is a central mediator in chronic periodontitis. Recently developed MMP-8-deficient mice show an impaired polymorphonuclear neutrophil response and more severe alveolar bone loss in *Porphyromonas gingivalis*-induced experimental periodontitis. The main mediators involved in neutrophil and monocyte/macrophage recruitment and in bone loss include lipopolysaccharide-induced CXC chemokine ligand 5 (LIX/CXCL5), stromal-derived factor-1/CXC chemokine ligand 12 (SDF1/CXCL12) and RANKL. Therefore, the aim of this study was to characterize the expression of LIX/CXCL5, SDF1/CXCL12 and RANKL in *Porphyromonas gingivalis*-induced experimental periodontitis in MMP-8$^{-/-}$ (knockout) and wild-type mice.

Material and methods: MMP-8 null and WT *P. gingivalis*-infected and uninfected mice were included. Histopathological changes were assessed and LIX/CXCL5, SDF1/CXCL12 and RANKL were immunodetected and quantified.

Results: Typical histopathological features of chronic periodontitis were seen in *P. gingivalis*-infected groups. LIX/CXCL5 expression was restricted to the gingival papilla in all four groups. Significantly lower expression of LIX/CXCL5 was seen in the knockout group compared with the wild-type infected group ($p < 0.05$). SDF1/CXCL12 and RANKL expression was mainly localized to the alveolar crest, including inflammatory leukocytes, vascular endothelium, osteoblasts and osteoclasts. Significant increases of SDF1/CXCL12 and RANKL were

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Key words: cytokines; matrix metalloproteinase; periodontal disease; animal model

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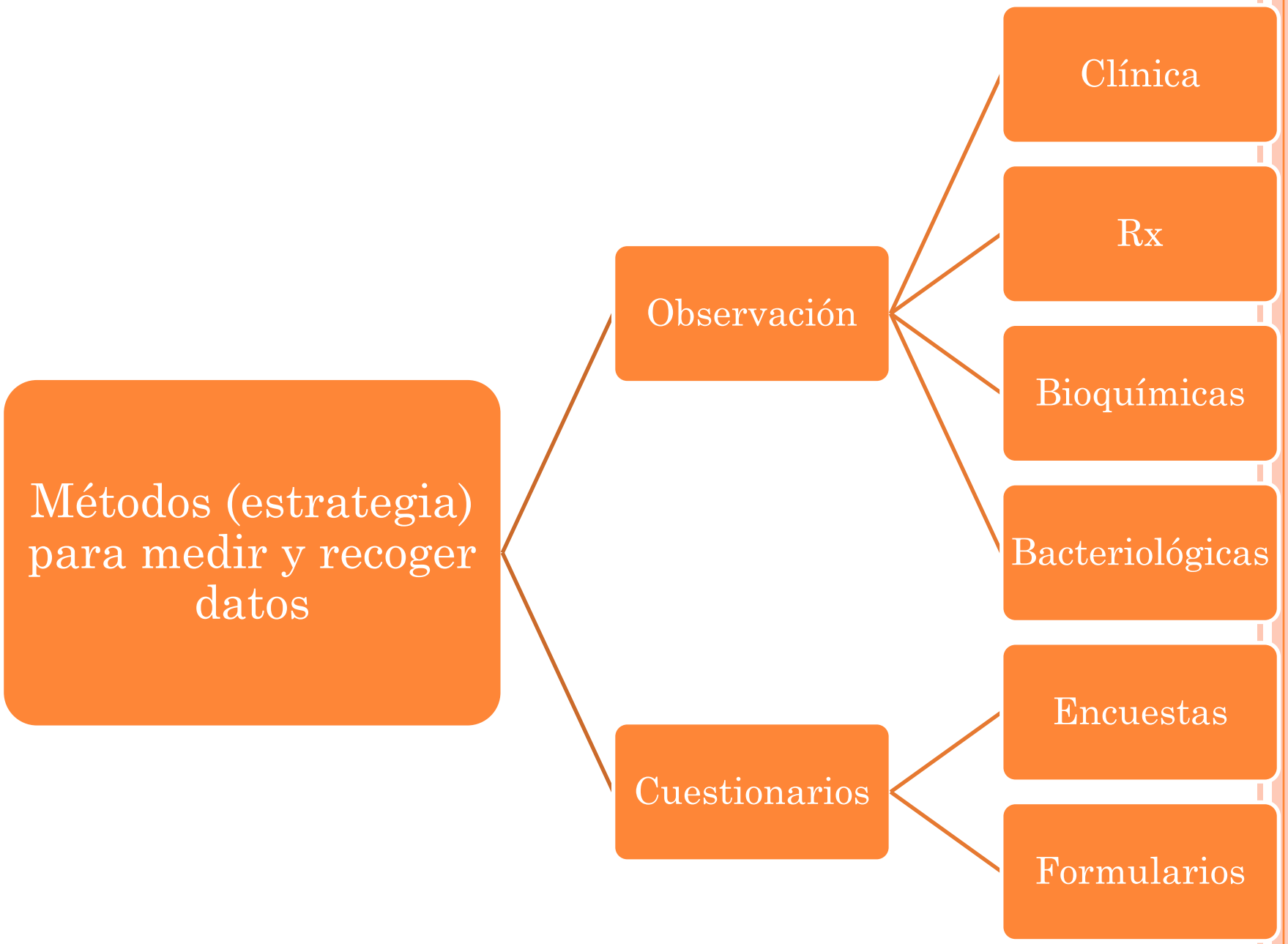
http://www.ncbi.nlm.nih.gov


Métodos (estrategia) para medir y recoger datos
Observación
Clínica
Rx
Bioquímicas
Bacteriológicas
Cuestionarios
Encuestas
Formularios


BAR. CLOSED
KII
(ANTEEKS PYYTÄEN)
TERWEMENOO
– OPEN –
TOMORROW
(MAYBE?)

Lectura recomendada

- O´Brien &Wright. How to write a protocol.J Orthod 29, 2002:58-61
- Nigel Smeeton. “Dental statistics made easy”. Radcliffe publishing. Oxon, UK, 2005.
- Hulley S & Cummings S. “Designing clinical research. Williams & Wilkins, Baltimore, 1998.
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