International Academy of Oral Medicine & Toxicology

IAOMT

Chemokine RANTES/CCL5 from Jawbone Cavitations

- Hidden Interface to Many Systemic-Immunological Diseases

Dr.med.dent. Dr.(PhD) Johann Lechner

drlechner@aol.com

www.dr-lechner.de

Clinic for

Integrative Dentistry

Munich Germany

What is RANTES?

Proinflammatory

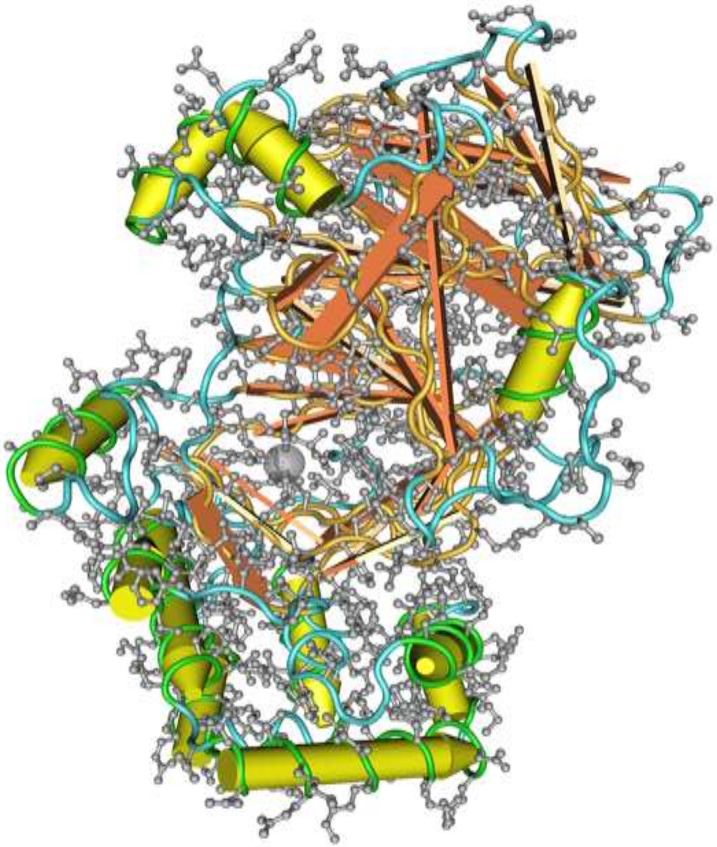
Chemokine CCL-5/

RANTES:

regulated on activation,

normal T cell expressed

and secreted



Why is RANTES/CCL5 of interest for dentist?

The critical interplay of

jawbone cavitations/bone marrow defects

and RANTES/CCL5 overexpression

in jawbone areas

Jawbone cavitations

without typical signs of acute inflammation

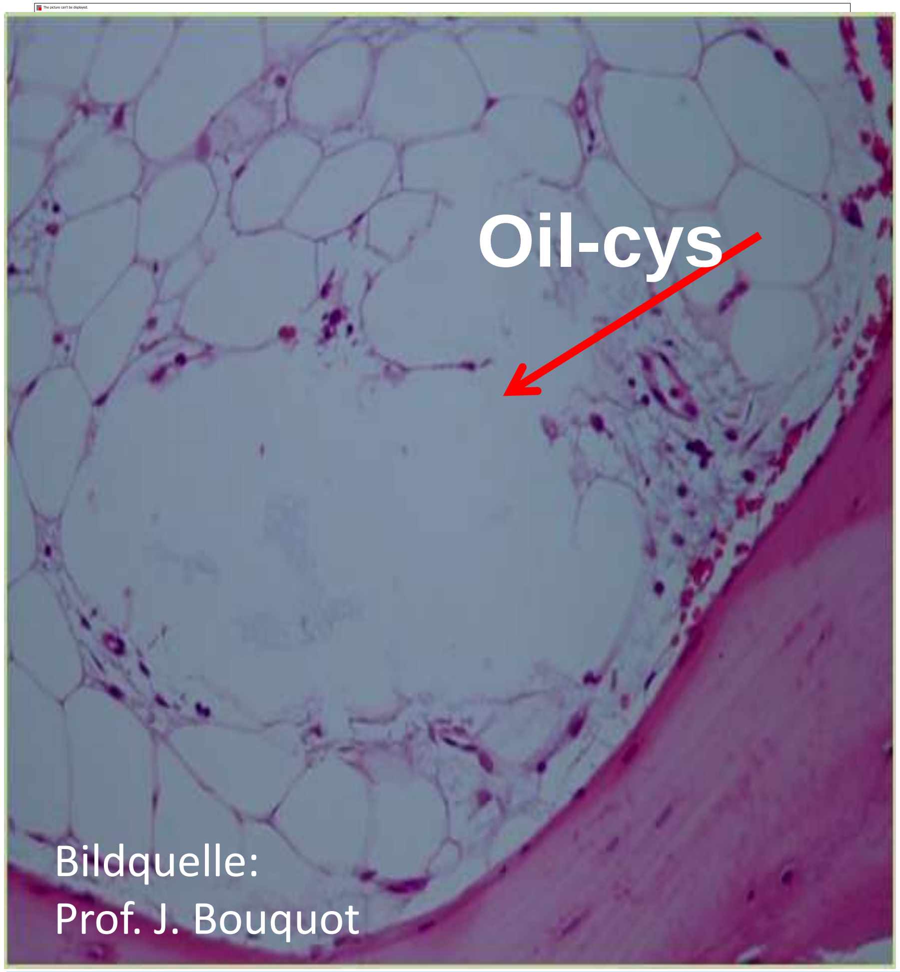
filled with **fatty-degenerated adipocytes**

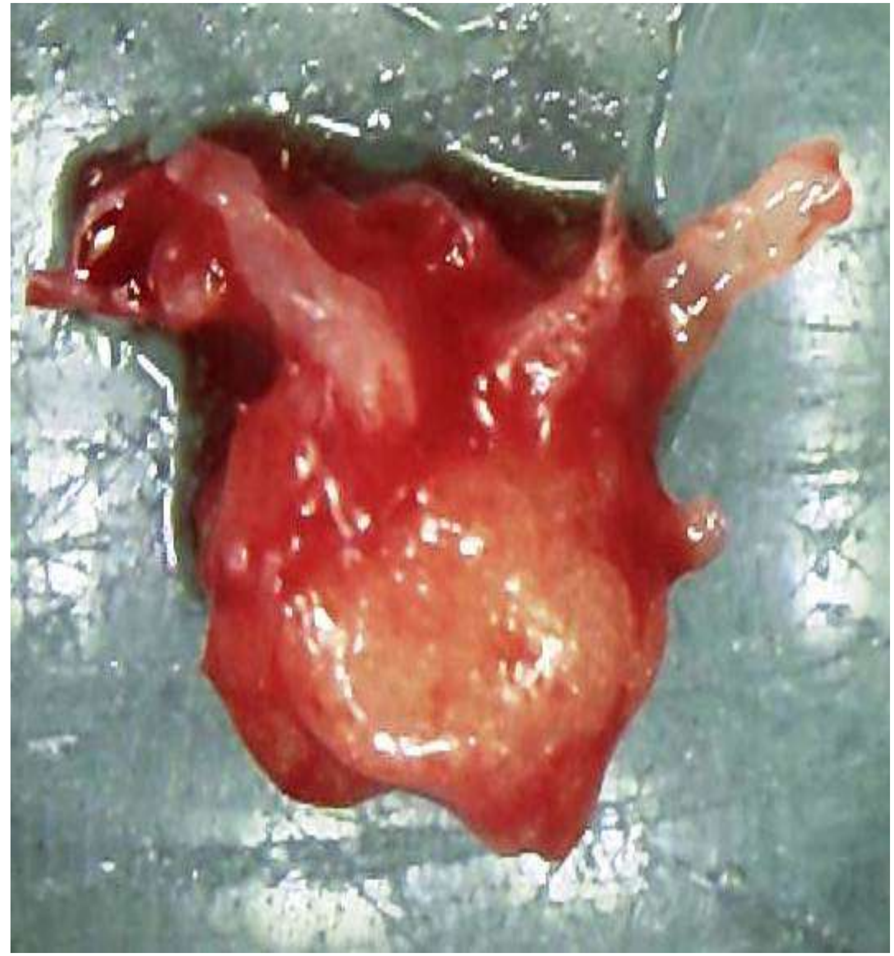
fatty **d**egenerated **o**steolysis of **j**awbone - FDOJ

in cases of facial/trigeminal pain is also called “NICO” (Bouquot: Neuralgia inducing cavitational osteonecrosis)

The object of our interest: Morphology and extent of a

Fatty-degenerative osteolysis/osteonecrosis of jawbone **(FDOJ)**

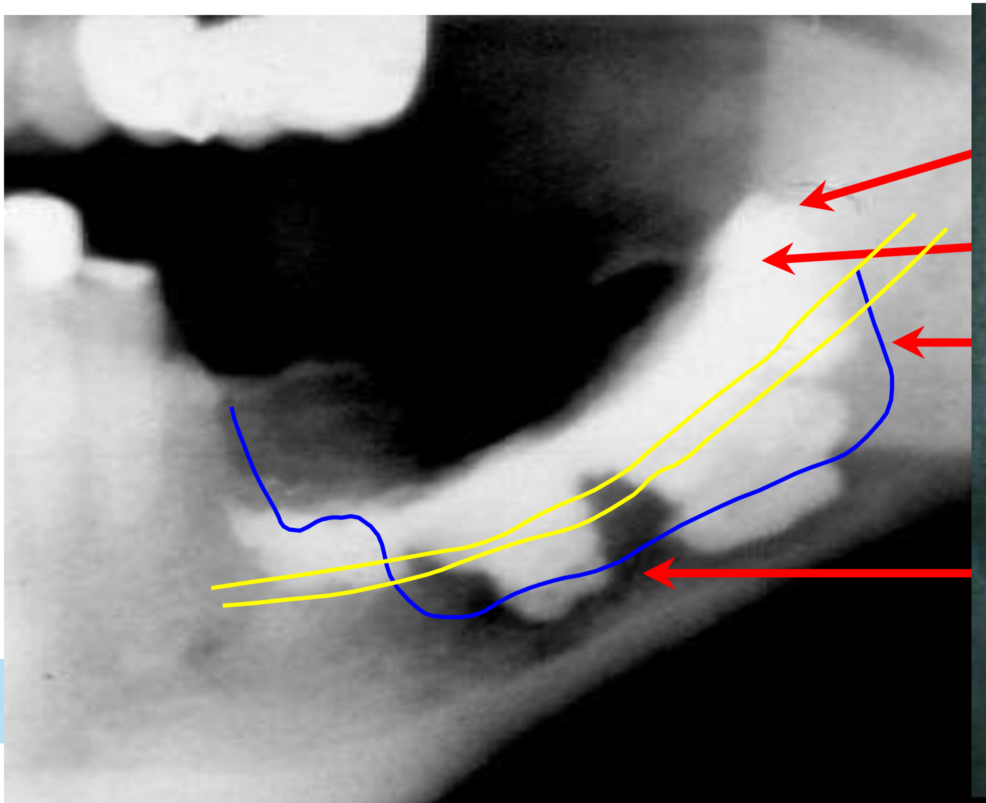


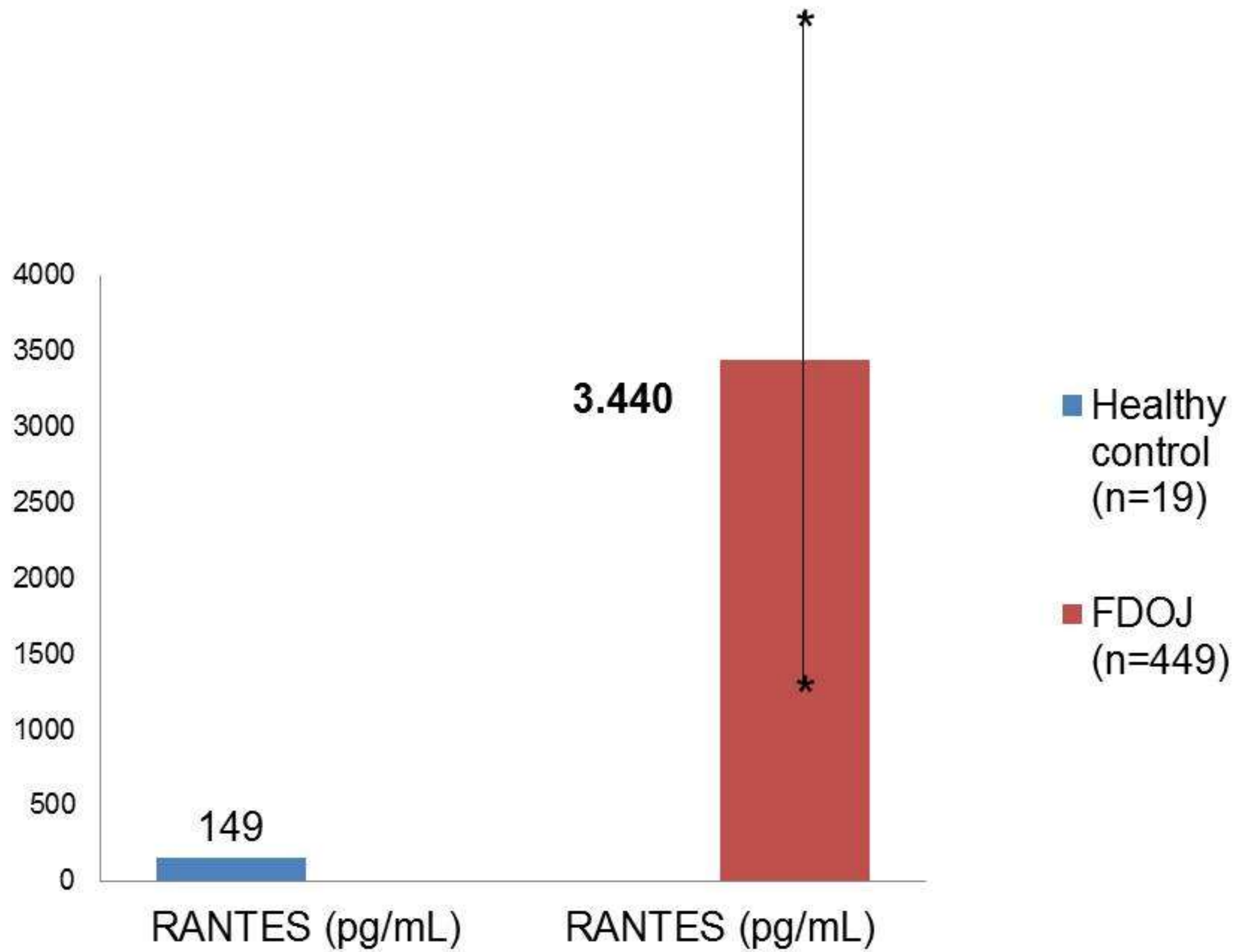


The guiding question of the presented research was:

Does FDOJ contain inflammatory immune messengers?

Can immune messengers-Cytokines in FDOJpossibly be related to silent inflammation and to systemic diseases?




4000
3500
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3.440
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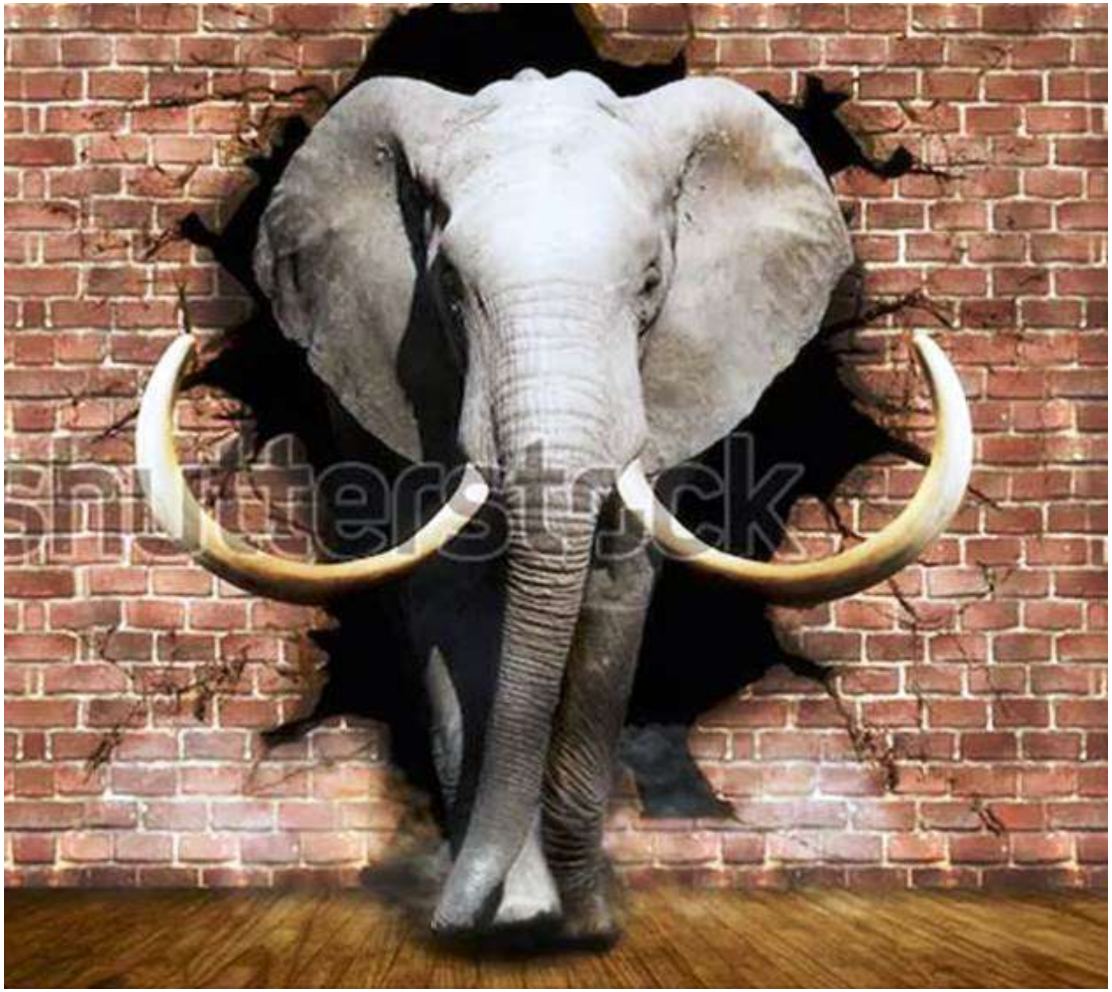
*
RANTES (pg/mL)
RANTES (pg/mL)
Healthy control (n=19)
FDOJ (n=449)

"Elephant

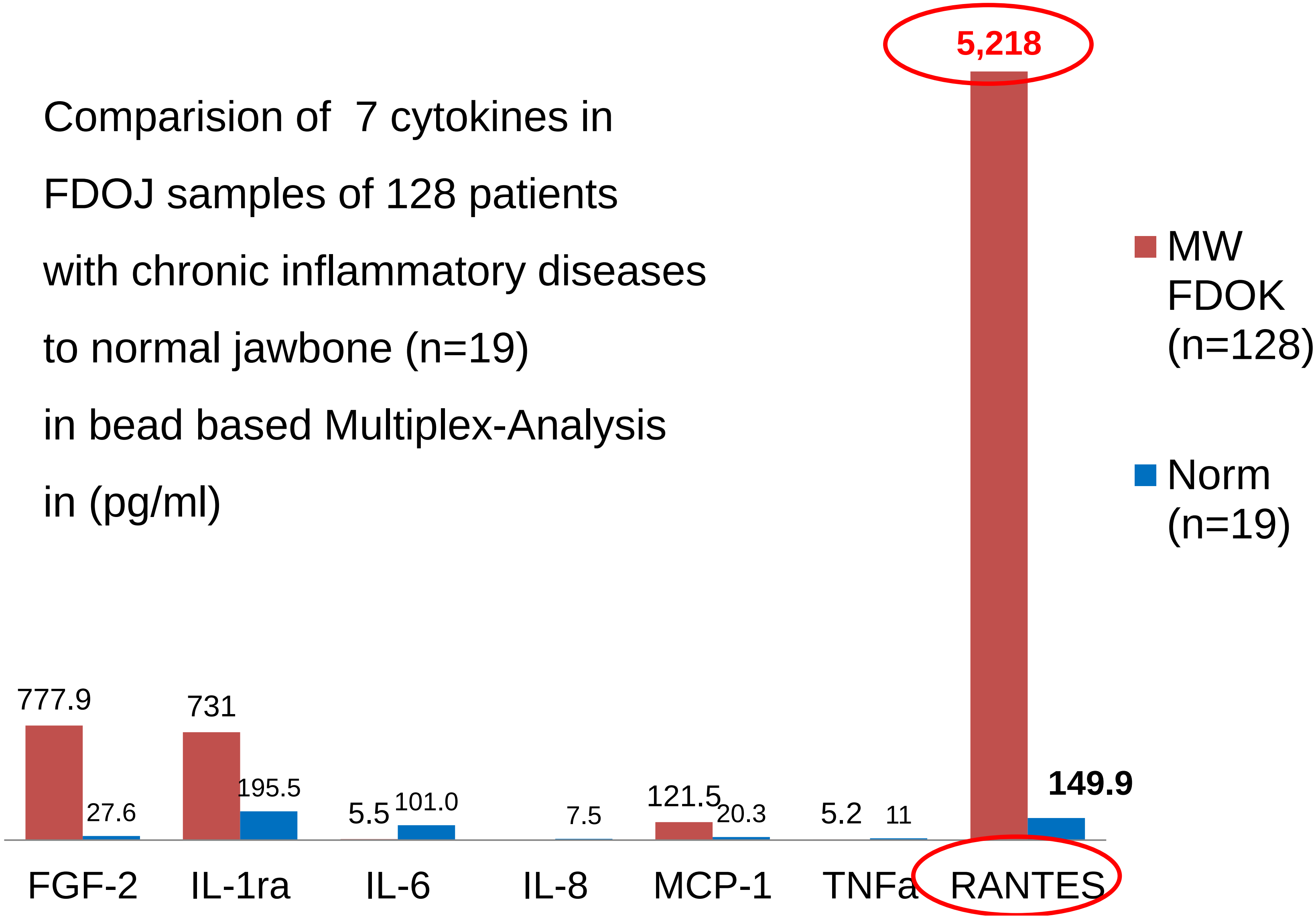
in the room"

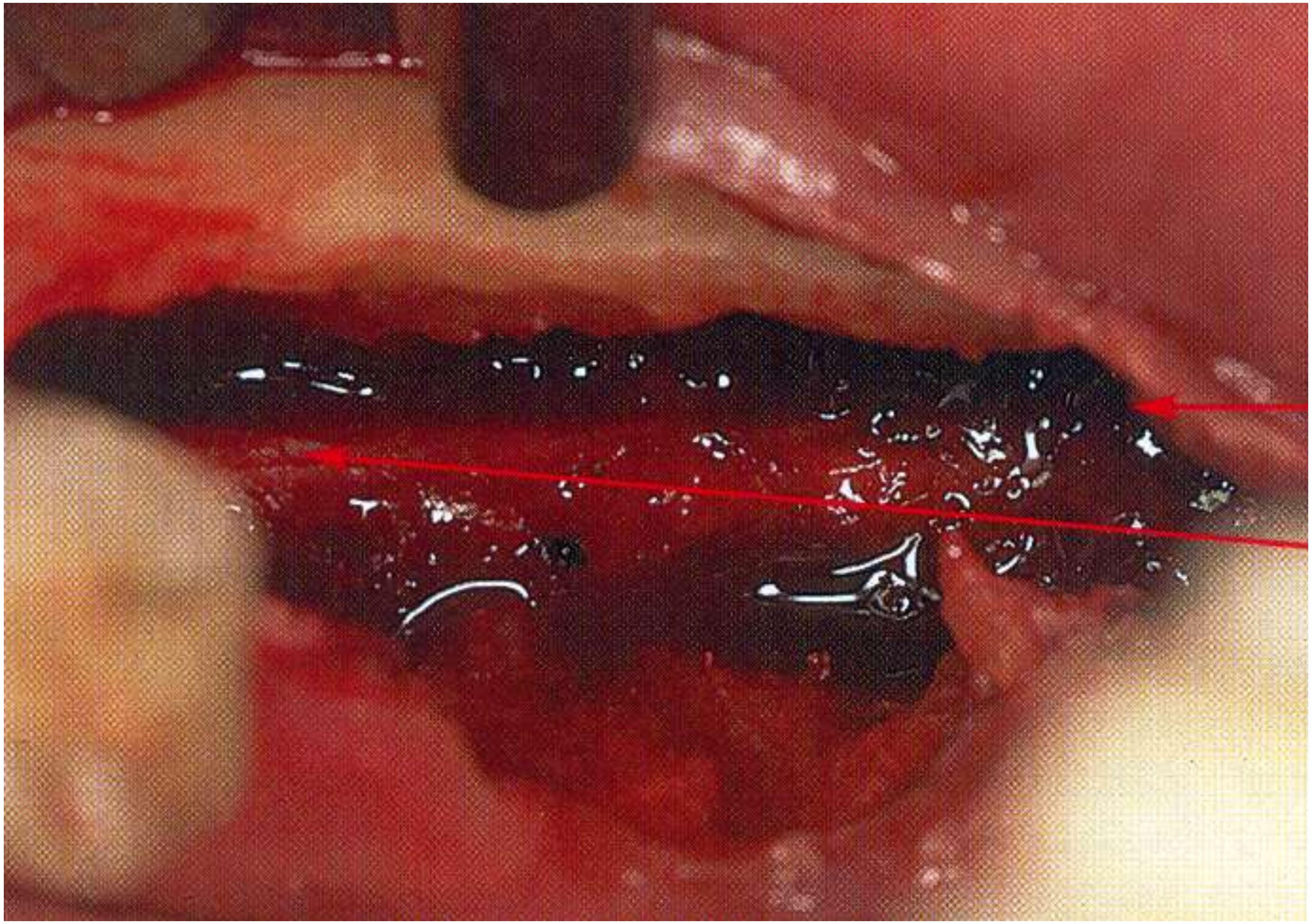


Is the local RANTES/CCL5 overexpression in

jawbone marrow defects of interest for general health?

Comparision of 7 cytokines in FDOJ samples of 128 patients with chronic inflammatory diseases to normal jawbone (n=19) in bead based Multiplex-Analysis in (pg/ml)





Manibular Nerve

Characteristics of RANTES

RANTES (Regulated upon Activation, Normal T-cell Expressed, and Secreted), CCL-5 = chemotactic cytokine = chemokine.

RANTES can have detrimental effects via the recruitment of immune cells that **enhance inflammatory processes such as arthritis, atopic dermatitis, nephritis, colitis, and other disorders** (Appay, V., S. L. Rowland-Jones. 2001. RANTES: a versatile and controversial chemokine. Trends Immunol. 22: 83-87)

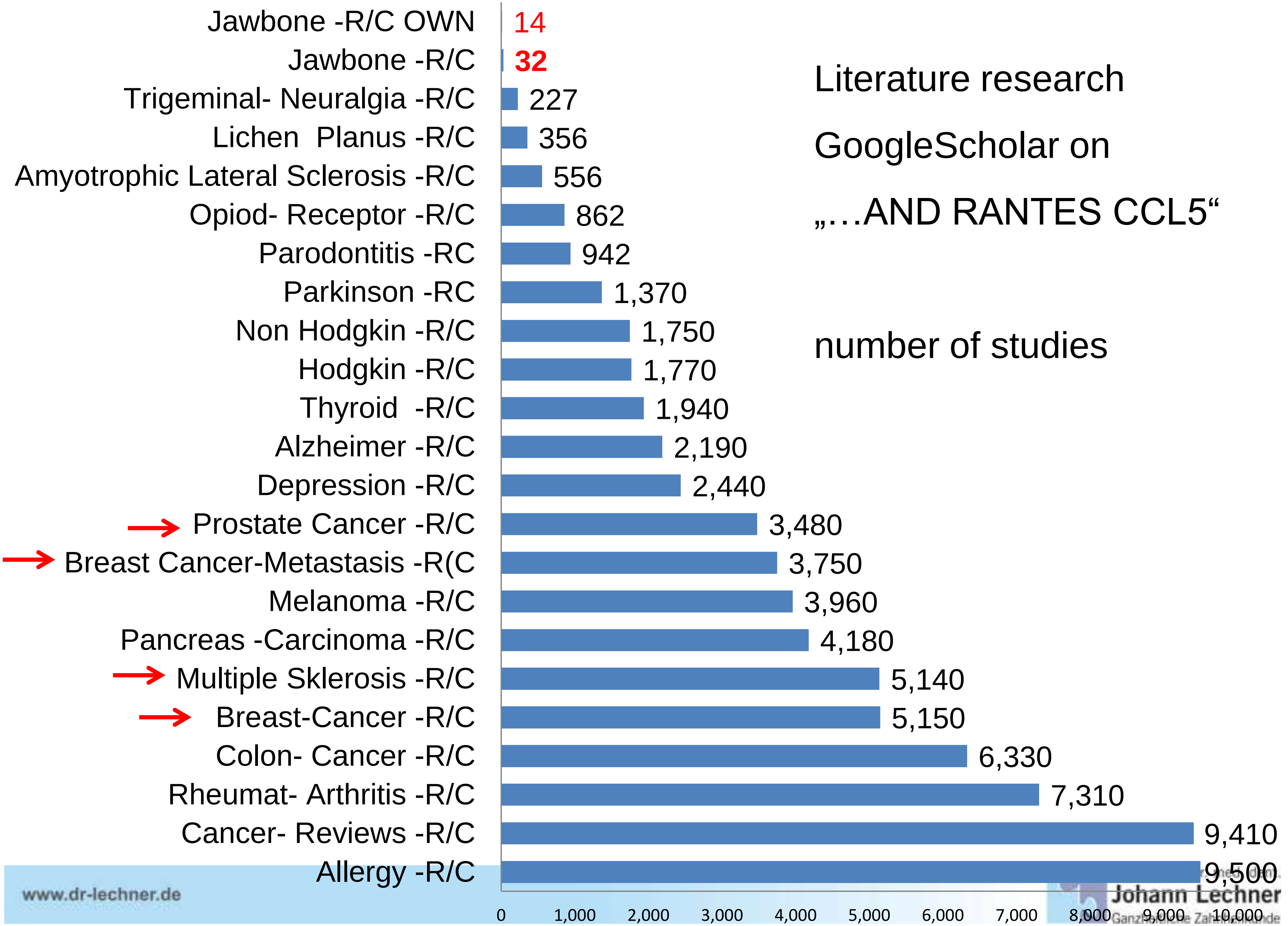
RANTES targets the central nervous system and i**s able to cause multiple sclerosis and Parkinson's disease**. In targeting mast cells, **RANTES causes allergies, alopecia (marked by hair loss), and thyroid disorders**.

(Rossi, D., A. Zlotnik. 2000. The biology of chemokines and their receptors. Annu. Rev. Immunol. 18: 217-242)

Why is RANTES/CCL5 interesting for general health?

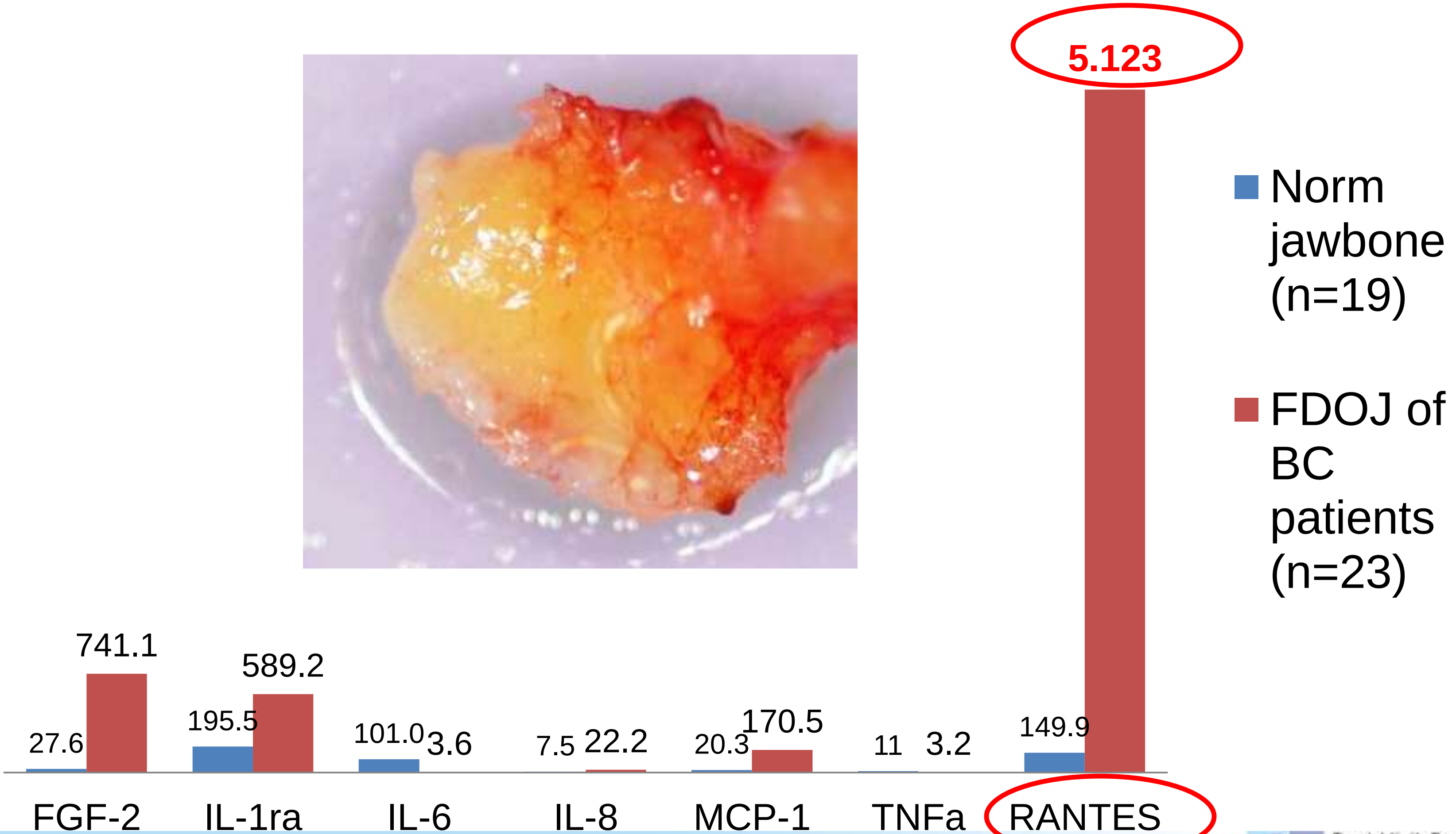
A simple answer is a literature research in GoogleScholar on

„*DISEAS* AND RANTES CCL5“

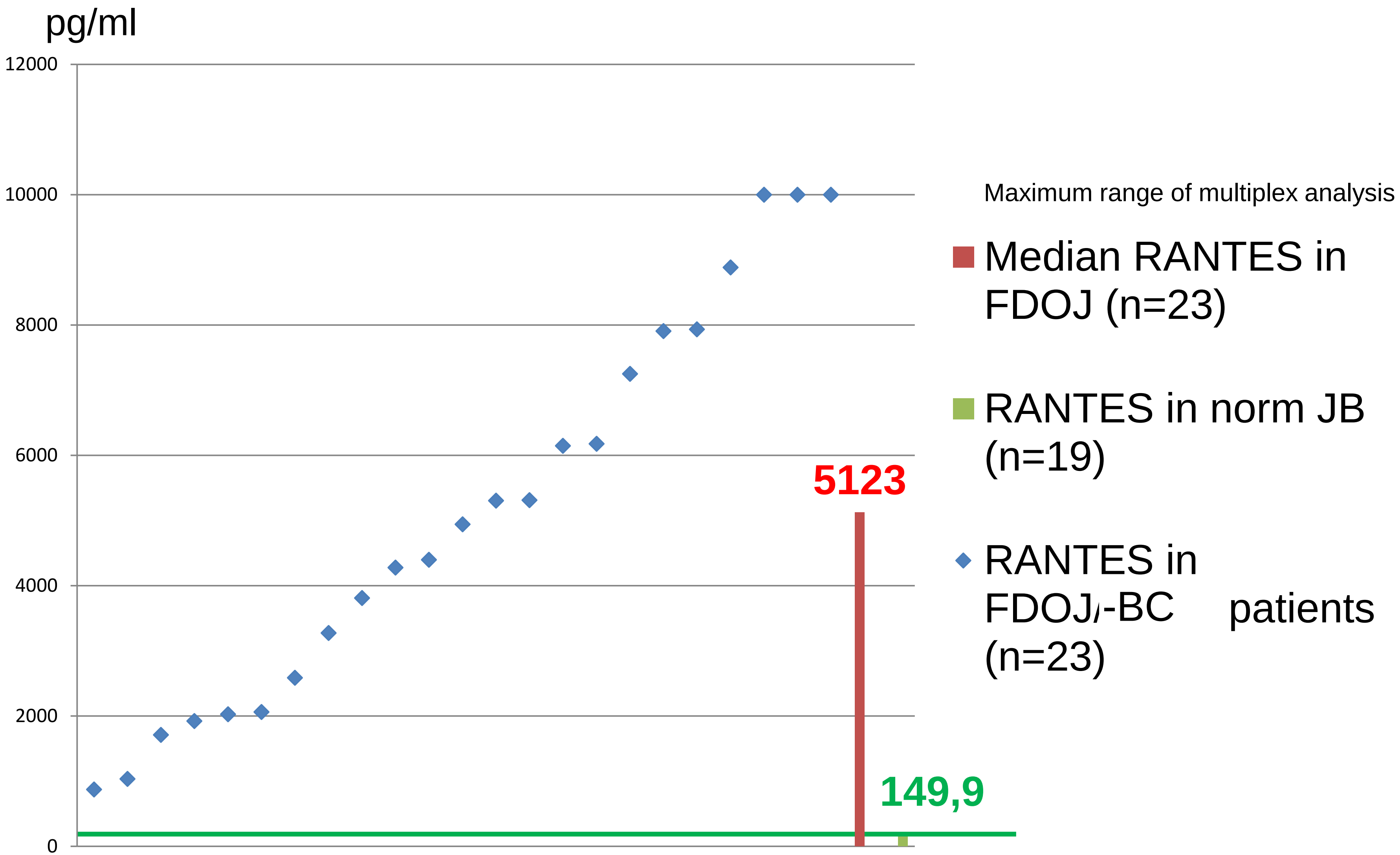

Literature research
GoogleScholar on
„…AND RANTES CCL5“
number of studies
Jawbone -R/C OWN 14
Jawbone -R/C 32
Trigeminal- Neuralgia -R/C 227
Lichen Planus -R/C 356
Amyotrophic Lateral Sclerosis -R/C 556
Opiod- Receptor -R/C 862
Parodontitis -RC 942
Parkinson -RC 1,370
Non Hodgkin -R/C 1,750
Hodgkin -R/C 1,770
Thyroid -R/C 1,940
Alzheimer -R/C 2,190
Depression -R/C 2,440
Prostate Cancer -R/C 3,480
Breast Cancer-Metastasis -R(C 3,750
Melanoma -R/C 3,960
Pancreas -Carcinoma -R/C 4,180
Multiple Sklerosis -R/C 5,140
Breast-Cancer -R/C 5,150
Colon- Cancer -R/C 6,330
Rheumat- Arthritis -R/C 7,310
Cancer- Reviews -R/C 9,410
Allergy -R/C 9,500
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
www.dr-lechner.de
Johann Lechner

Bead-based processing (Luminex®):

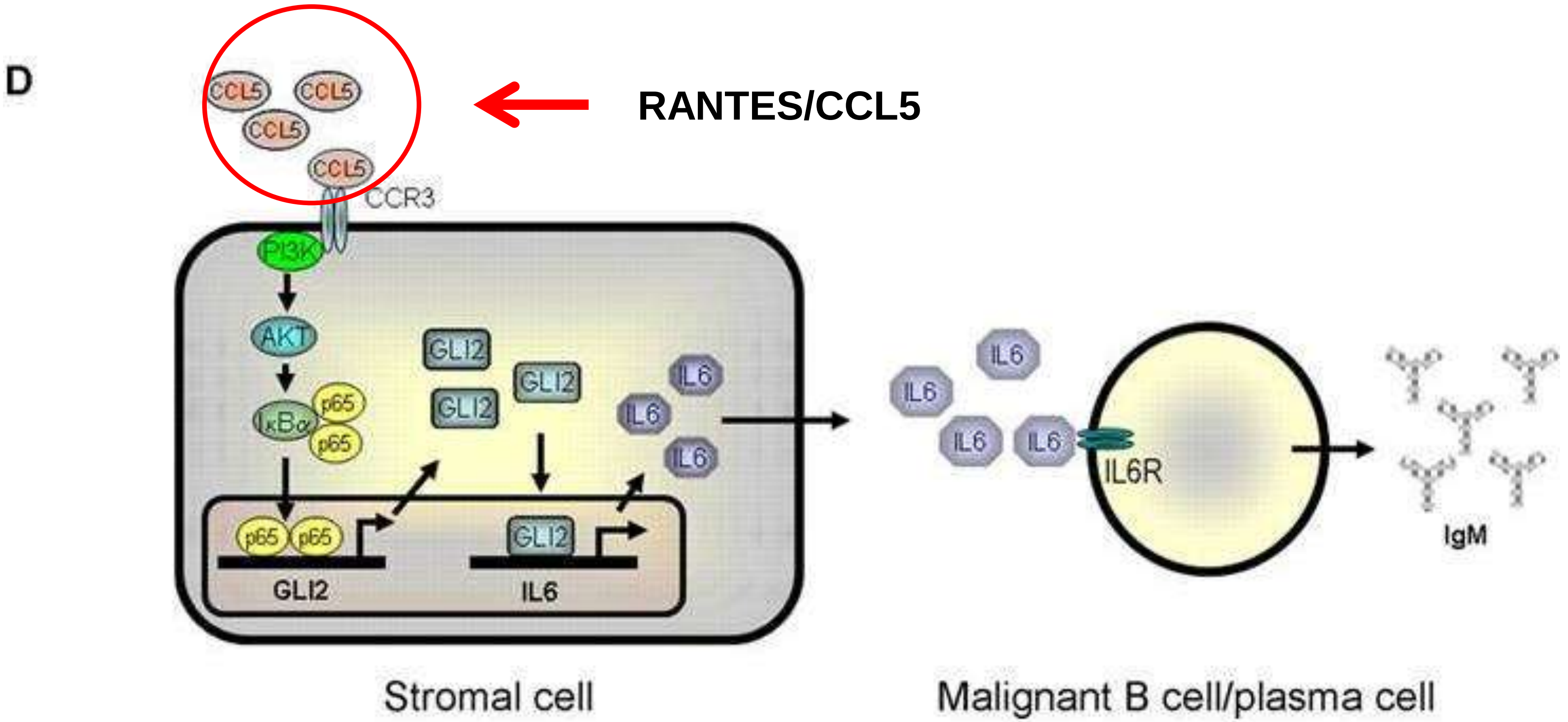
7 cytokines in FDOJ (pg/ml) in **BC patients** (n=23) compared to normal jawbone (n=19) (pg/ml)



Distribution of RANTES (pg/ml) in FDOJ of **BC patients** (n=23)



RANTES/CCL5 mediates cytokine cross-talk in the tumor microenvironment



Sherine F. Elsawa et al. J. Biol. Chem. 2011;286:21524-21534

RANTES and its role in breast cancer

RANTES has been associated as well with the induction or promotion of cancer (e.g., prostate and breast).

Soria, G., A. Ben-Baruch. 2008. The inflammatory chemokines CCL2 and CCL5 in breast cancer. Cancer Lett. 267: 271-285

….development of breast cancer is the potential ability of RANTES, to act directly on the tumor cells and to promote progression of the tumor.

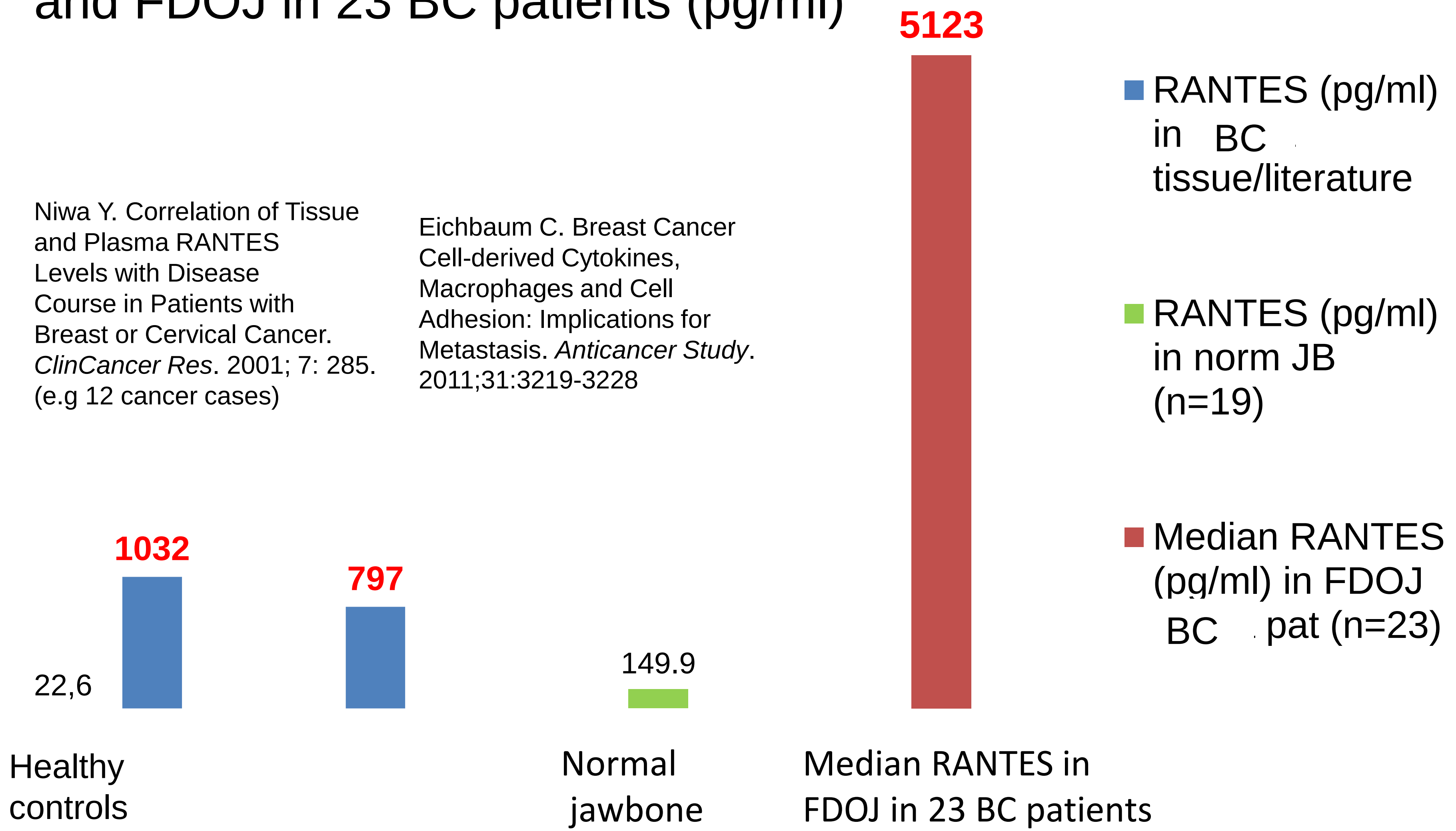
Niwa, Y. et al. Correlation of Tissue and Plasma RANTES Levels with Disease Course in Patients with Breast or Cervical Cancer. ClinCancer Res February 2001 *7;* 285.

“.. analysis of RANTES expression demonstrates that expression of RANTES in breast tumor cells is elevated significantly…

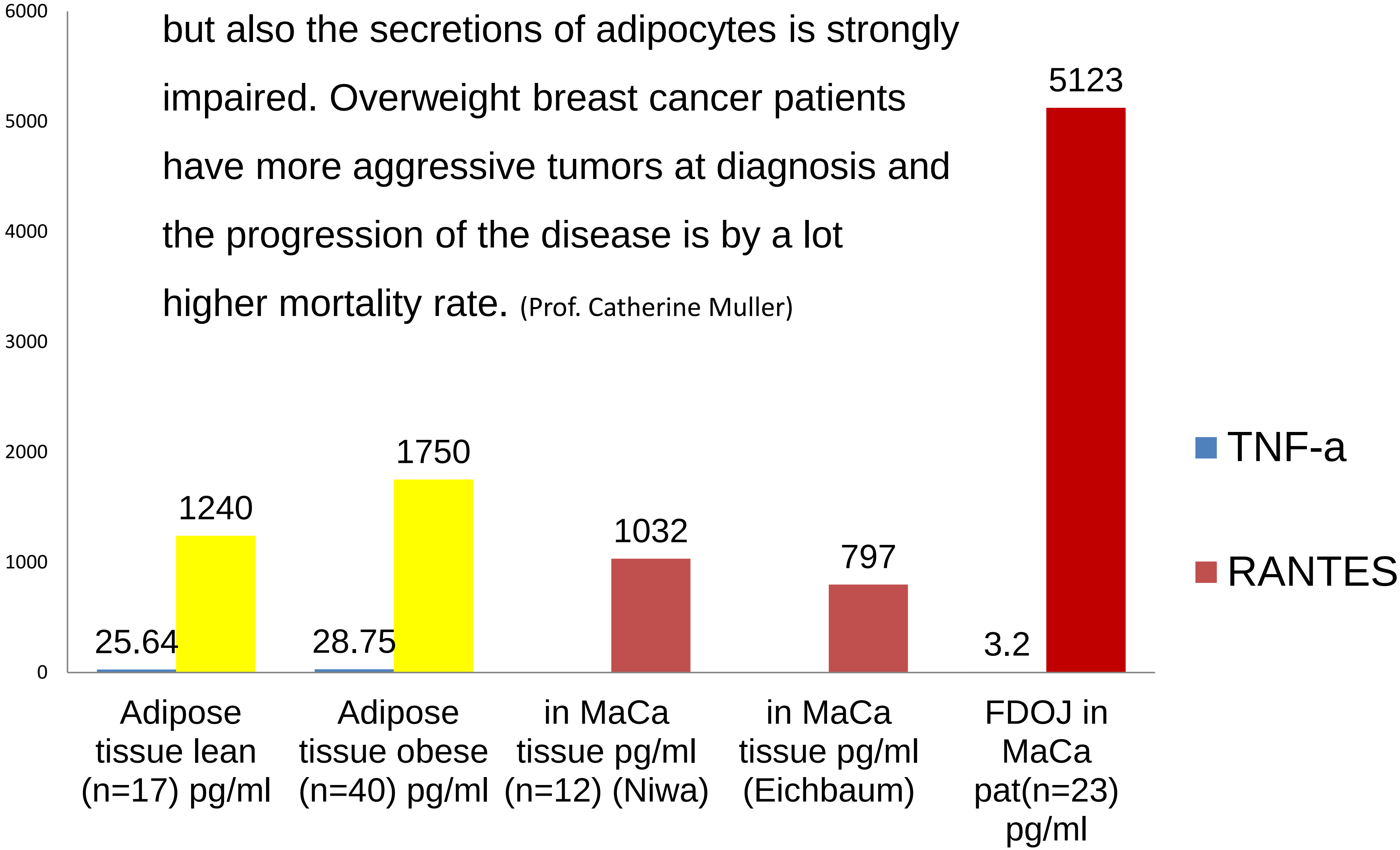
breast tumor cell-derived RANTES may promote breast cancer progression.“

Azenshtein E. et al The CC chemokine RANTES in breast carcinoma progression: regulation of expression and potential mechanisms of promalignant activity. Cancer Res. 2002 Feb 15;62(4):1093-102.).

Comparison of RANTES in **BC tissue** to normal jawbone and FDOJ in 23 BC patients (pg/ml)



Obesity is not just about size and number, but also the secretions of adipocytes is strongly impaired. Overweight breast cancer patients have more aggressive tumors at diagnosis and the progression of the disease is by a lot higher mortality rate. (Prof. Catherine Muller)



RANTES/CCL5 expression in FDOJ in 23 BC cases is

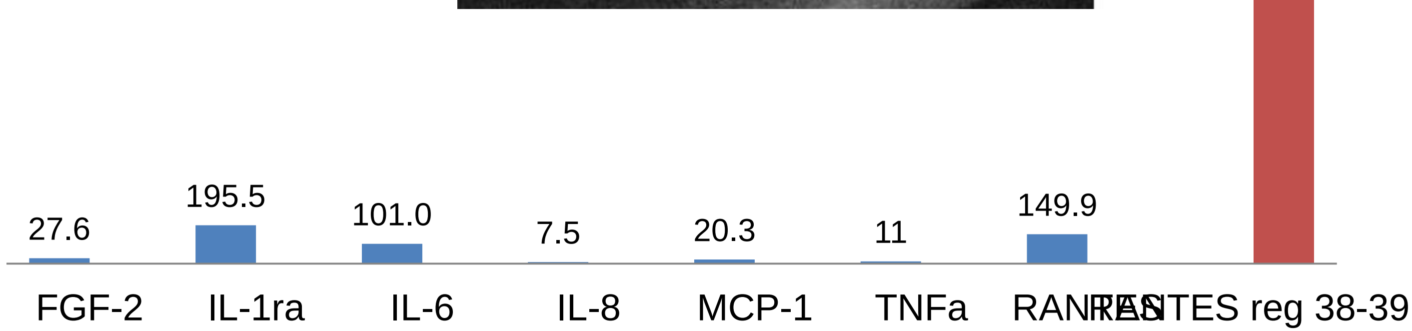
- 35-fold higher than in normal jawbone
- 5-fold higher than in BC tissue

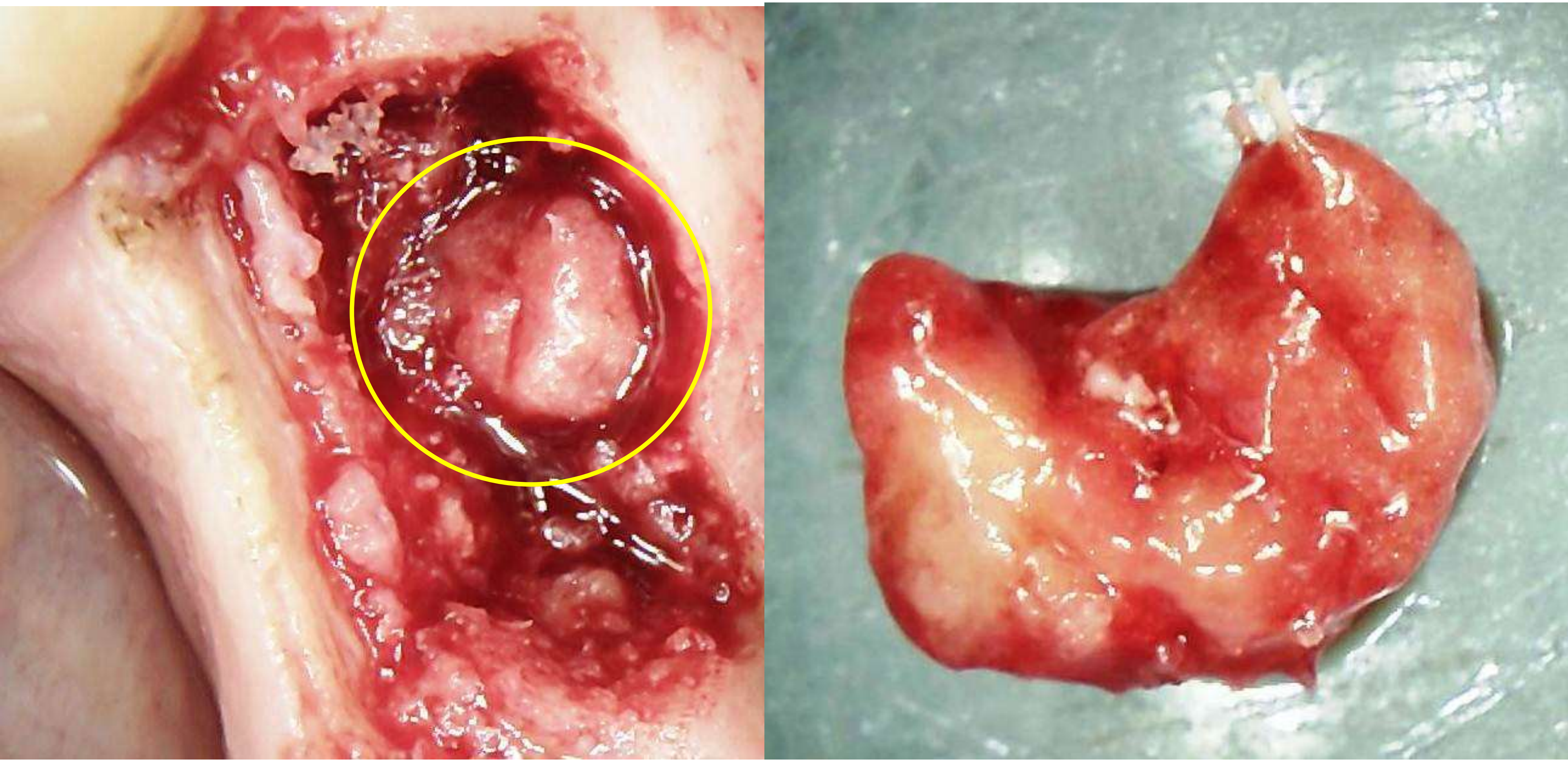
„The body's own stem cells stimulate cancer cells to mutate, to spread and to form tumors in other organs…This enhanced metastatic ability is reversible and is dependent on CCL5/RANTES signaling…"

Karnoub AE., et al. Mesenchymal stem cells within tumourstroma promote breast cancer metastasis. Nature, Volume 449, Issue 7162, pp. 557-563 (2007).

7 cytokines in retromolar area with **metastasis of BC** compared to normal jawbone (n=19)

Pathohistology:
„Metastasis of adenocarcinoma of breast cancer in jawbone“





Left panel: retromolar area after decortication shows fatty bone marrow

Right panel: lump of fatty-degenerated Osteolysis/osteonecrosis of bone marrow

RANTES/CCL5 and its role in BC metastasis

…RANTES can also increase the metastatic potential of cancer cells.

Eissa S.A.L. et al. Importance of Serum IL-18 and RANTES as Markers for Breast Carcinoma Progression, Journal of the Egyptian Nat. CancerInst., Vol. 17, No. 1, March: 51-55, 2005.

…BC cells stimulate secretion of RANTES from mesenchymal stem cells, which then acts on cancer cells to enhance their motility, invasion and metastasis.

Karnoub,A et al. Mesenchymal stem cells within tumourstroma promote breast cancer metastasis, Nature, Volume 449, Issue 7162, pp. 557-563 (2007).

…this increased propensity towards metastasis is reversible and dependent on the RANTES signaling.

Azenshtein E. et al The CC chemokine RANTES in breast carcinoma progression: regulation of expression and potential mechanisms of promalignant activity. Cancer Res. 2002 Feb 15;62(4):1093-102.).

Immunohistochemic staining of FDOJ

- jawbone marrow defects

The visible prove

of RANTES/CCL5 signaling pathway

connection from jawbone to tumors

We generated a panel of **anti-RANTES monoclonal antibodies** for immunohistologic staining of RANTES expression in jawbone.

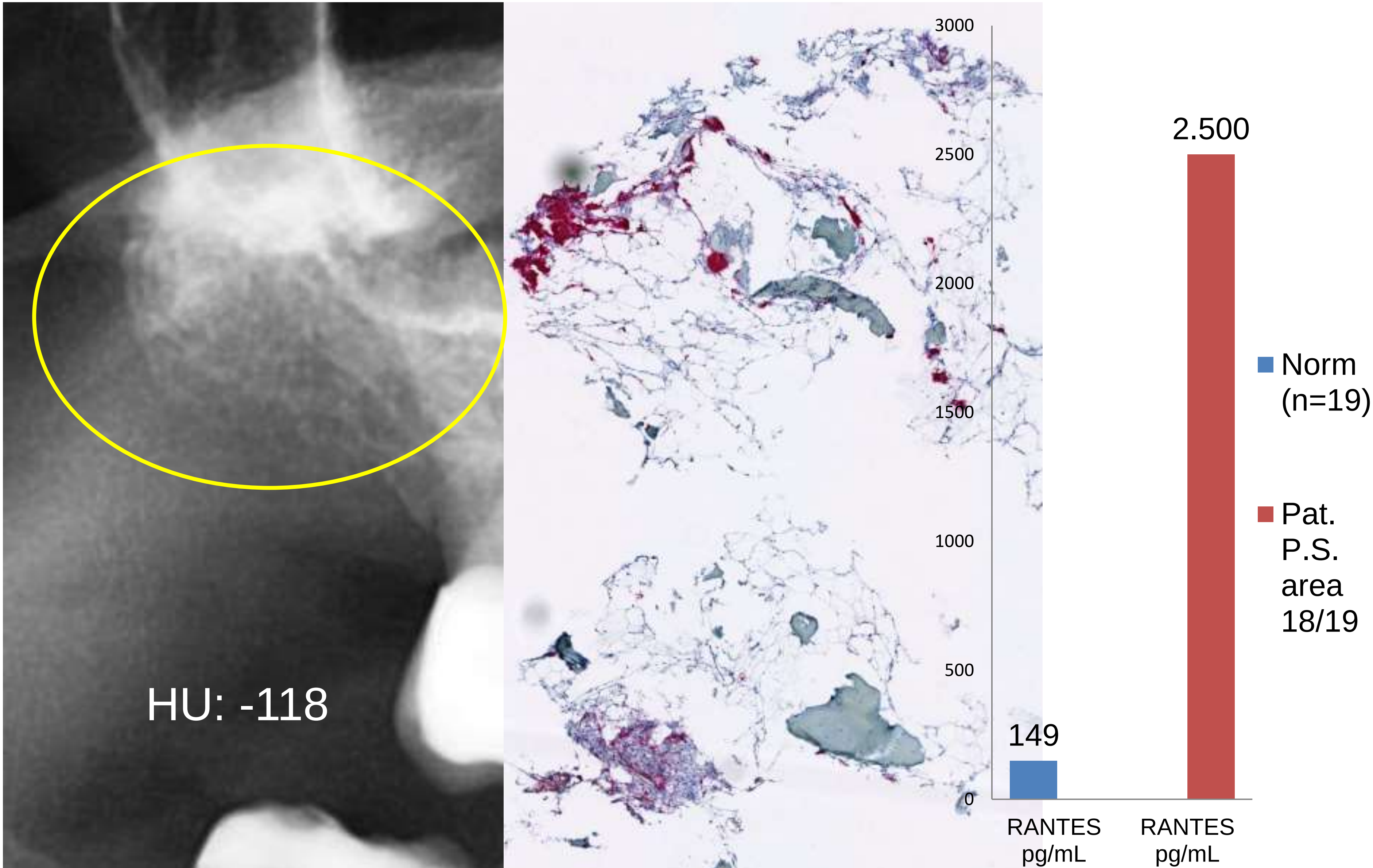
Most normal adult tissues contain **few, if any, RANTES positive cells.**

In contrast, RANTES expression dramatically increases in inflammatory sites. In addition, megakaryocytes and some tumours, express high levels of RANTES message and protein.

von Luettichau I at al. **RANTES chemokine expression in diseased and normal human tissues.** Cytokine. 1996 Jan;8(1):89-98.

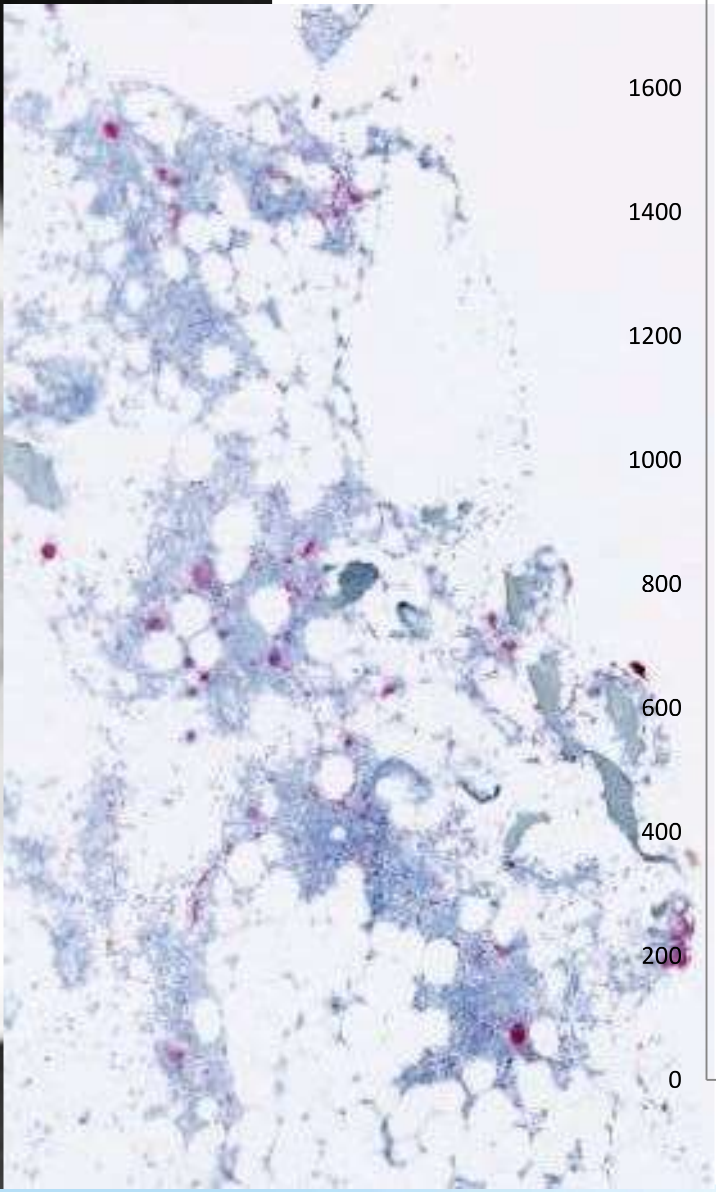
These results indicate a wider expression of RANTES than previously appreciated and suggest multiple physiologic roles for this soluble factor.

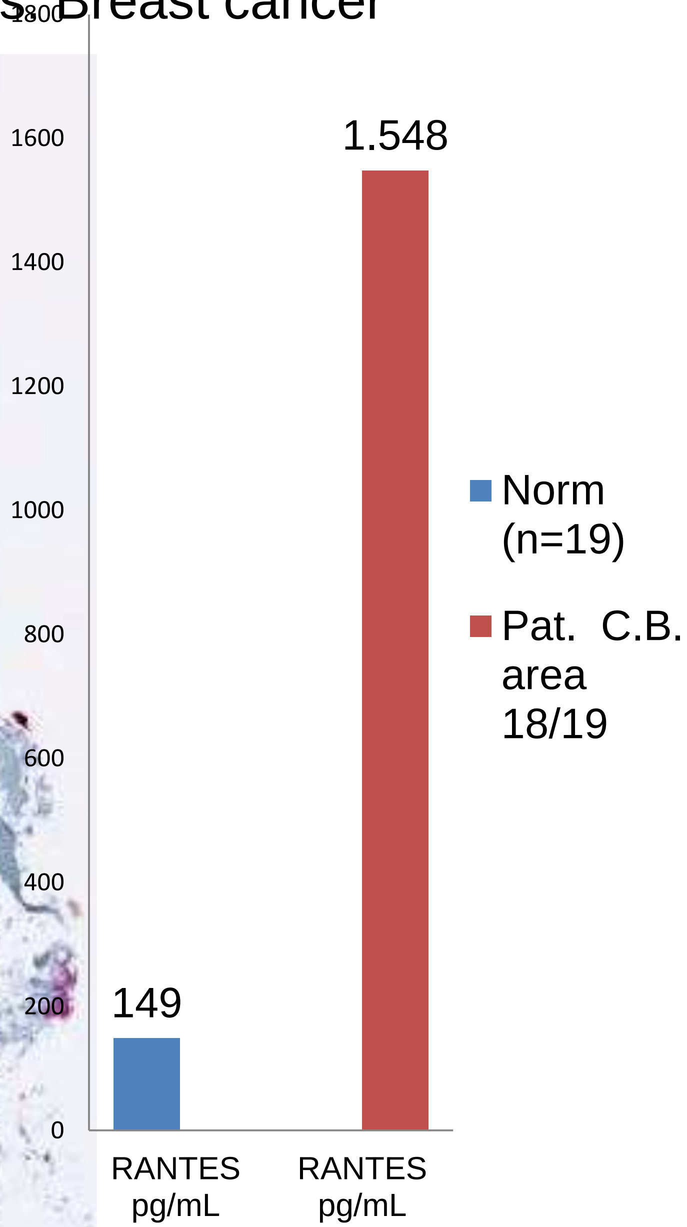
Female, aged 51 years; clinical diagnosis: Breast cancer

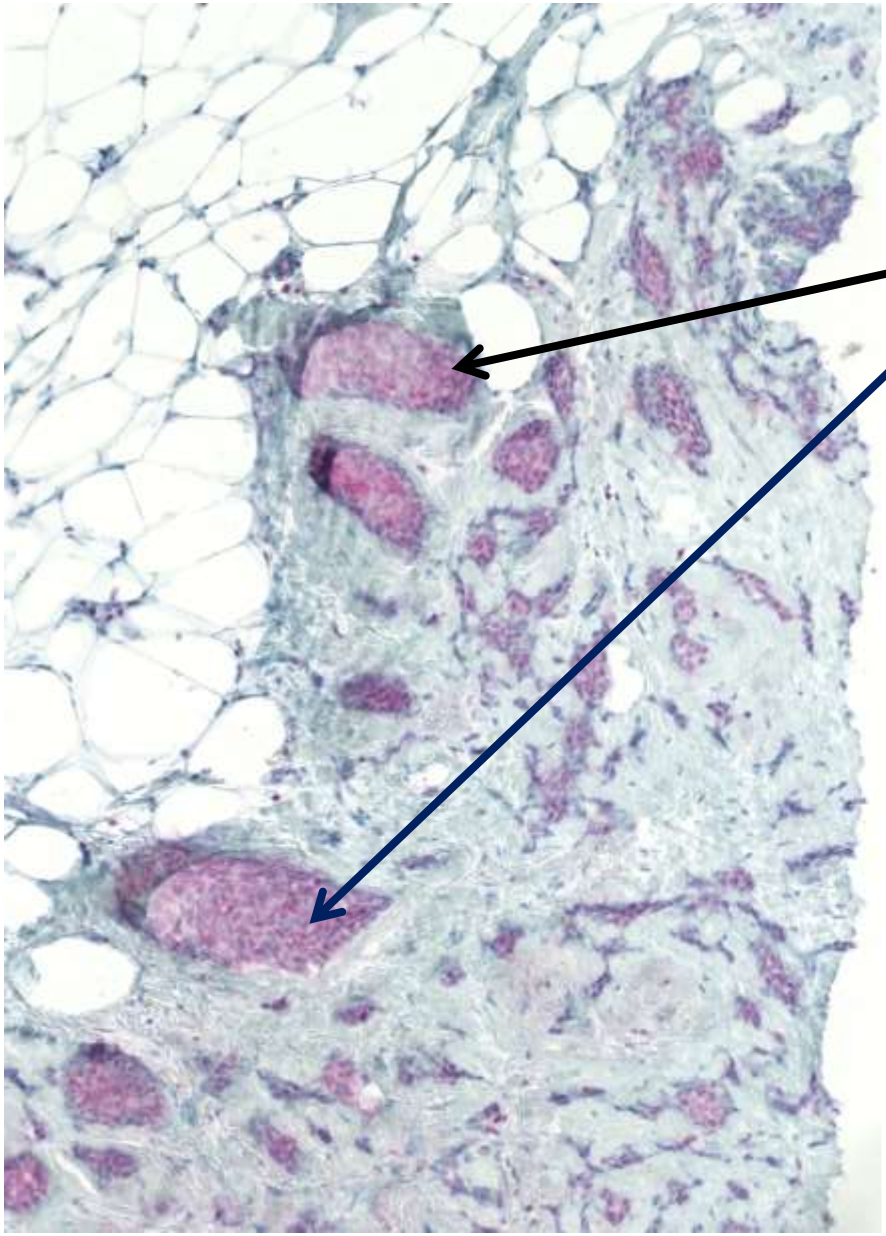



0,6 mm

Female, aged 63 years; clinical diagnosis: Breast cancer

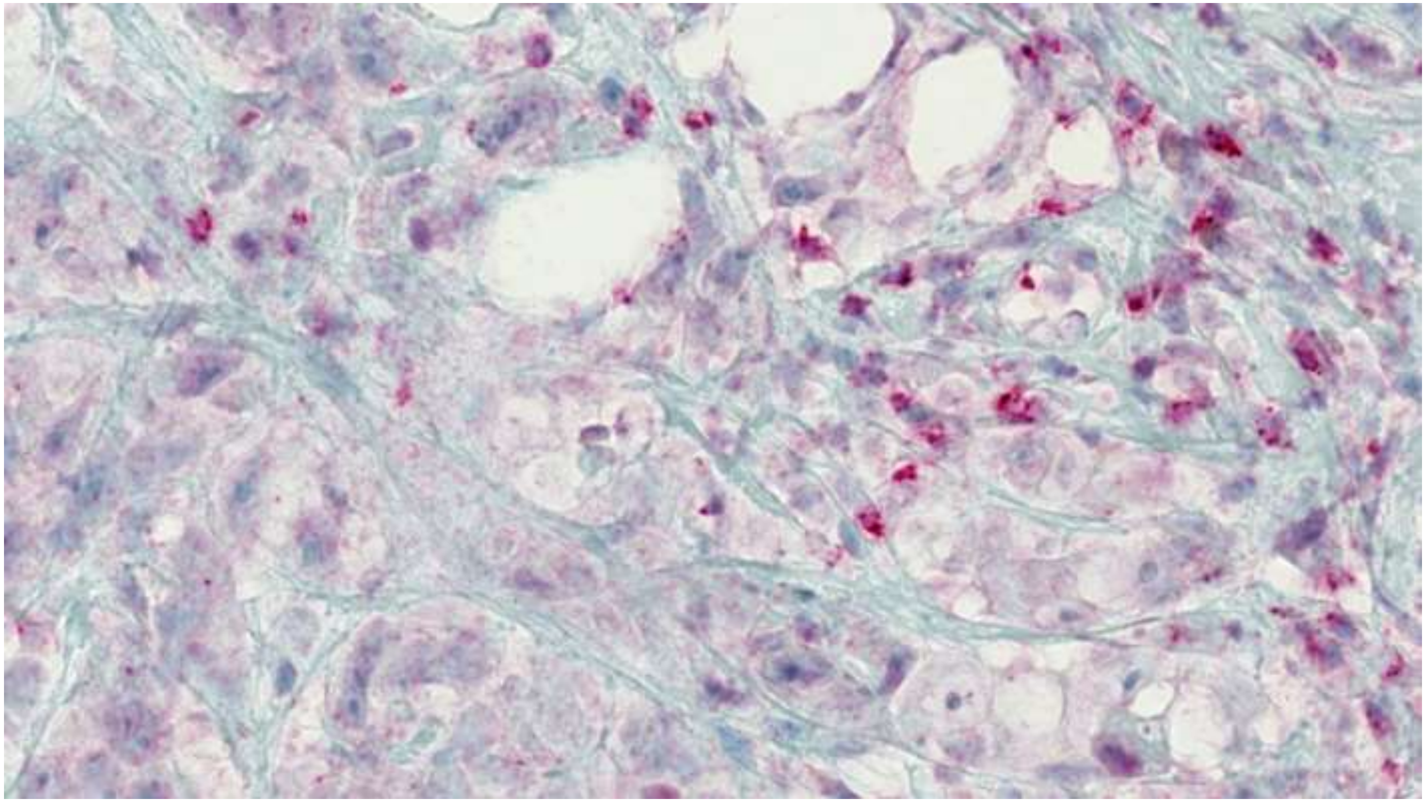






Duct-invasive breast carcinoma with RANTES/CCL5-positive tumor cell nests (arrows).

The staining is not as strong as in the FDOJ samples.

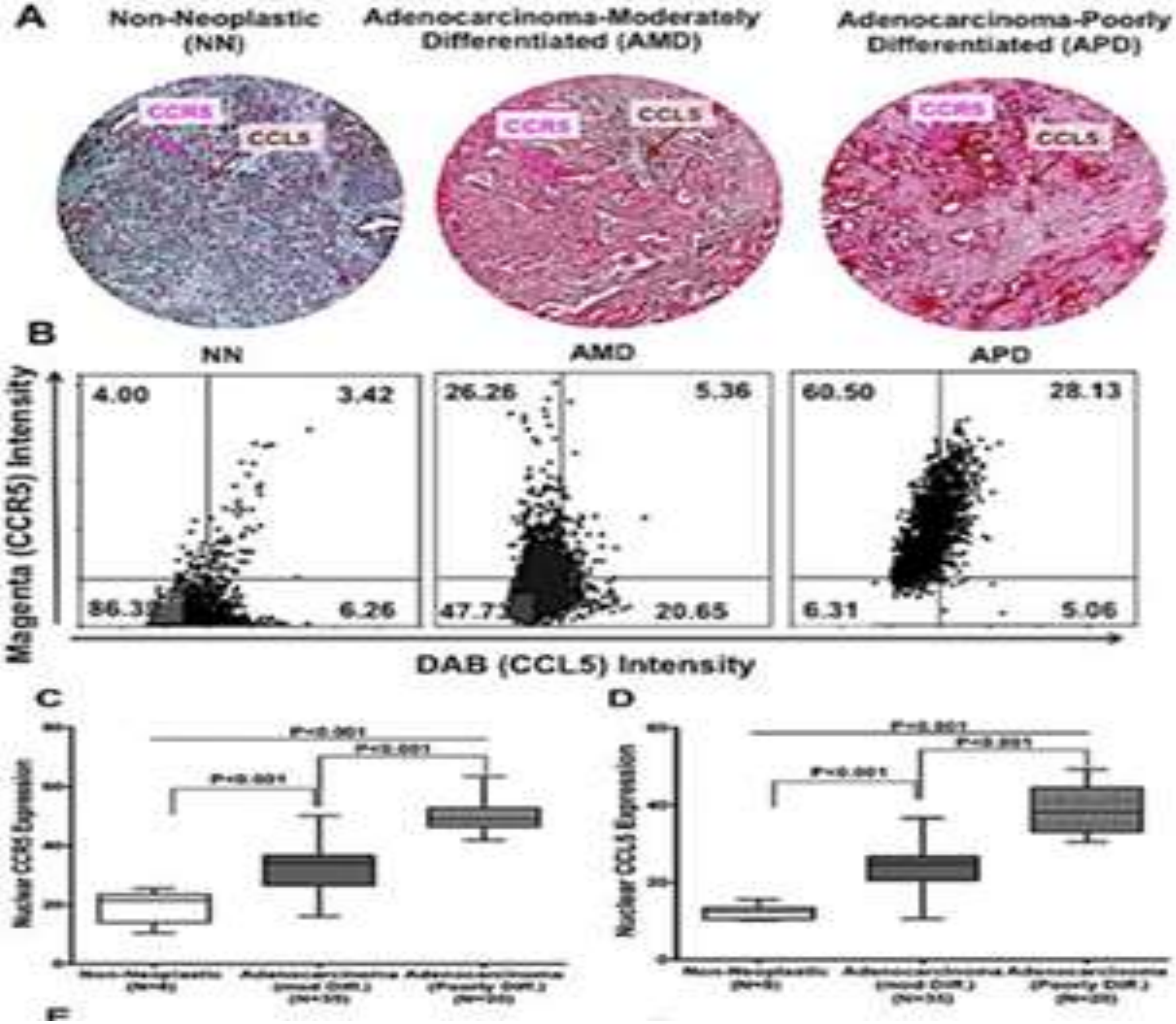


Breast cancer and associated connective adipose tissue.

There are also distinct RANTES/CCL5-stained cells,

while the breast cancer epithelial tracts show only mild-to-moderate,

non-specific background staining.



CCR5/CCL5 axis interaction promotes migratory and invasiveness of pancreatic cancer cells

Santosh Kumar Singh, Manoj K. Mishra, Isam-Eldin A. Eltoum, Sejong Bae, James W. Lillard Jr. & Rajesh Singh

Scientific Reports **8**, Article number: 1323 (2018)

If chronic inflammation, per se, were a sentinel event in the transformation of a normal cell to a cancer cell, one would expect a high incidence of cancer in patients with chronic arthritis, but that is not evident. **Why?**

The answer is:

RANTES/CCL5

and NOT TNF-a

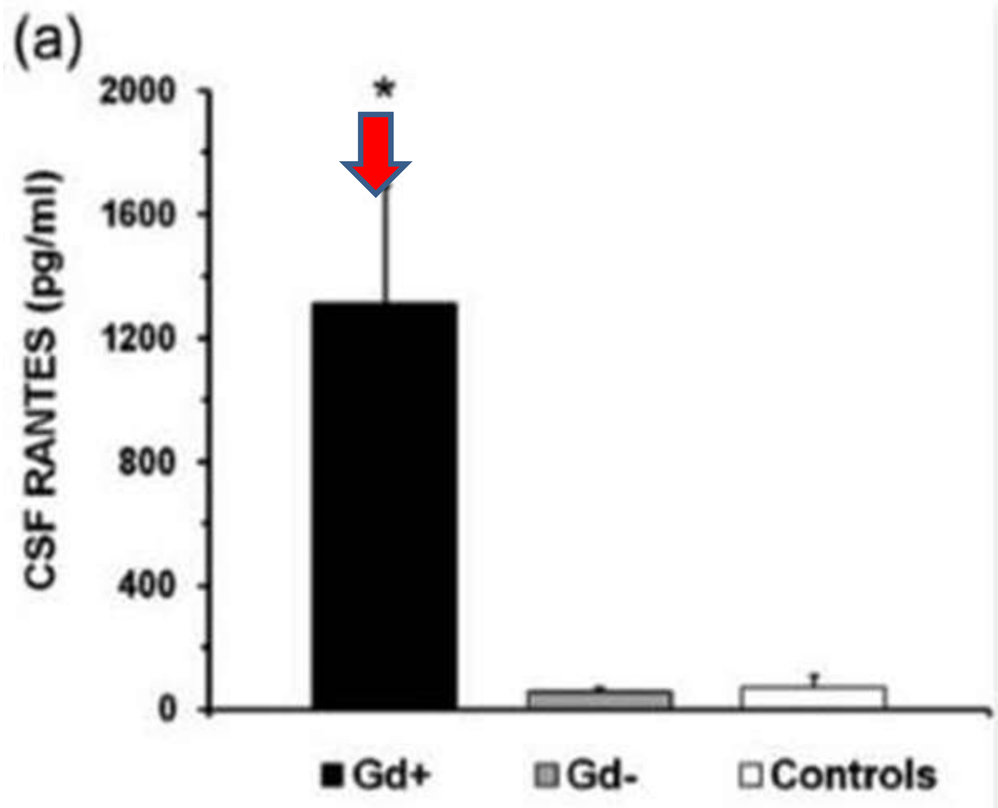
is possibly the signal

for cancer development

Lechner J, Schuett S, von Baehr V.
"Aseptic-avascular osteonecrosis: local "silent inflammation" in the jawbone and RANTES/CCL5 overexpression.
Clinical, Cosmetic and Investigational Dentistry 2017:9 99–109.

	TNF-a	IL-6	RANTES
Rheumatoid arthritis	+++	++	+
Osteoporosis	+++	++	-
Obesity	+++		-
Periodontitis	+++	++	+
Peri-implantitis	+++	++	-
Biphosphonate-induced osteonecrosis	++	++	-
Fatty-degenerative osteonecrosis	-	-	+++

RANTES–levels in CerebroSpinalFluid (CSF) of MS-patients

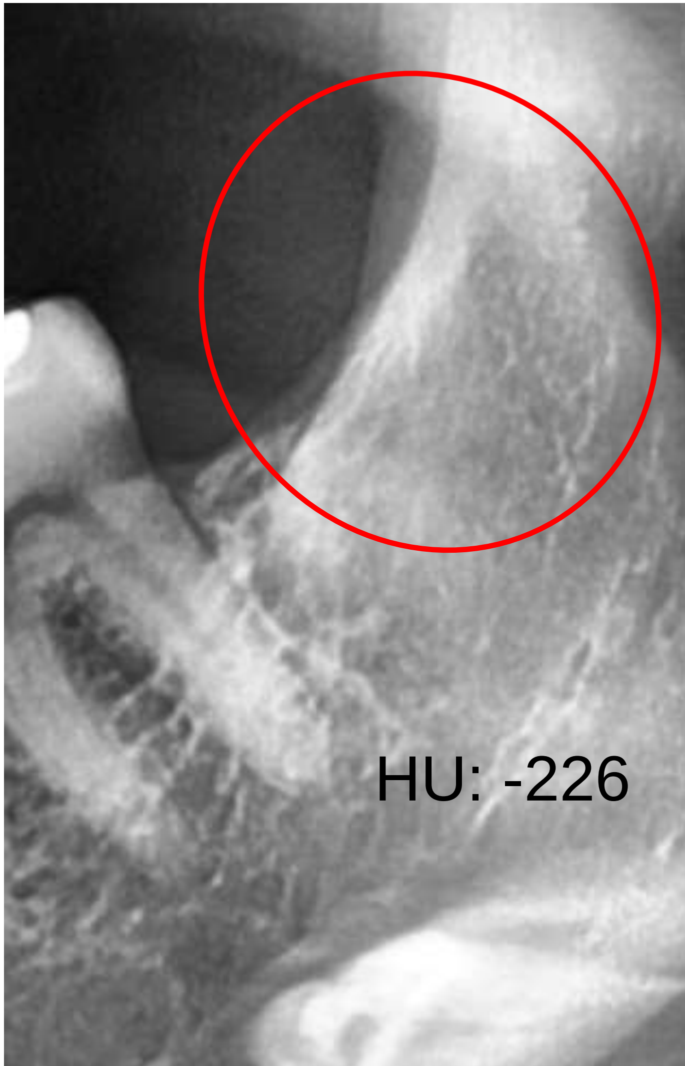


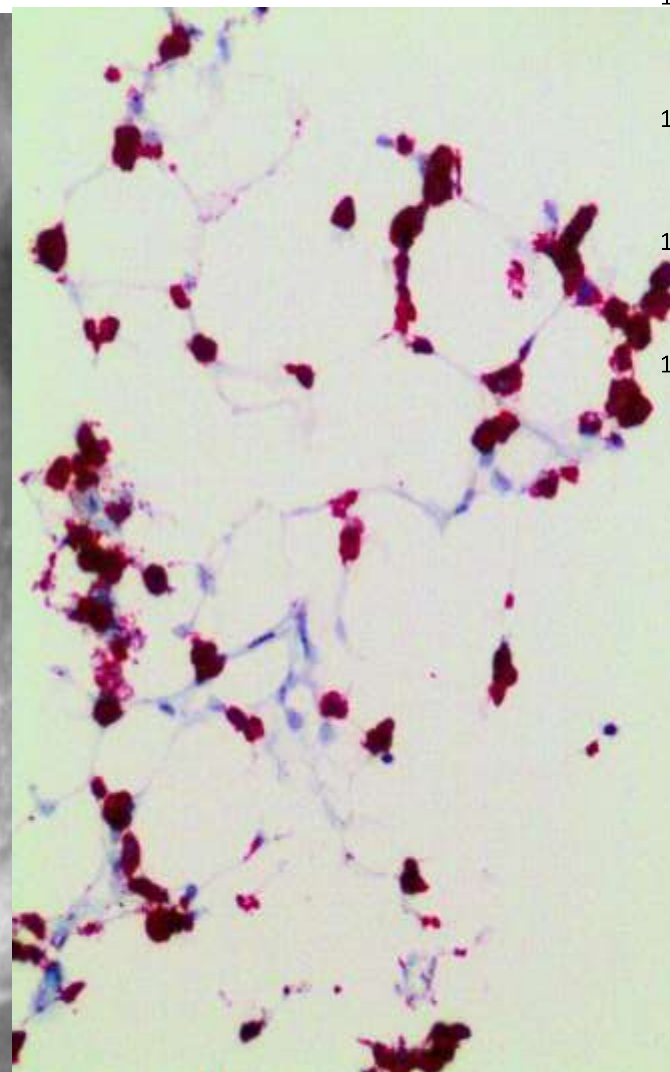
“CSF levels of RANTES were remarkably high only in active MS patients….

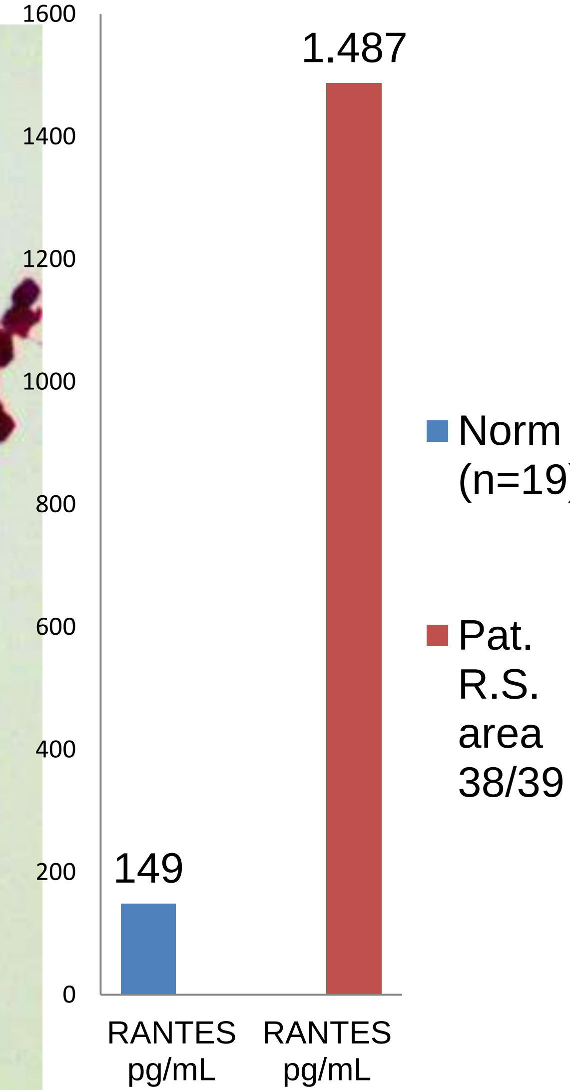
RANTES correlates with inflammation and synaptic excitability in MS brains.”

Mori F, et al. RANTES correlates with inflammatory activity and synaptic excitability in multiple sclerosis. Multiple Sclerosis Journal1–8; DOI: 10.1177/ 1352458515621796

Female, aged 58 years; clinical diagnosis: ALS







….in order to investigate whether RANTES as index of immune activation is present in ALS patients.

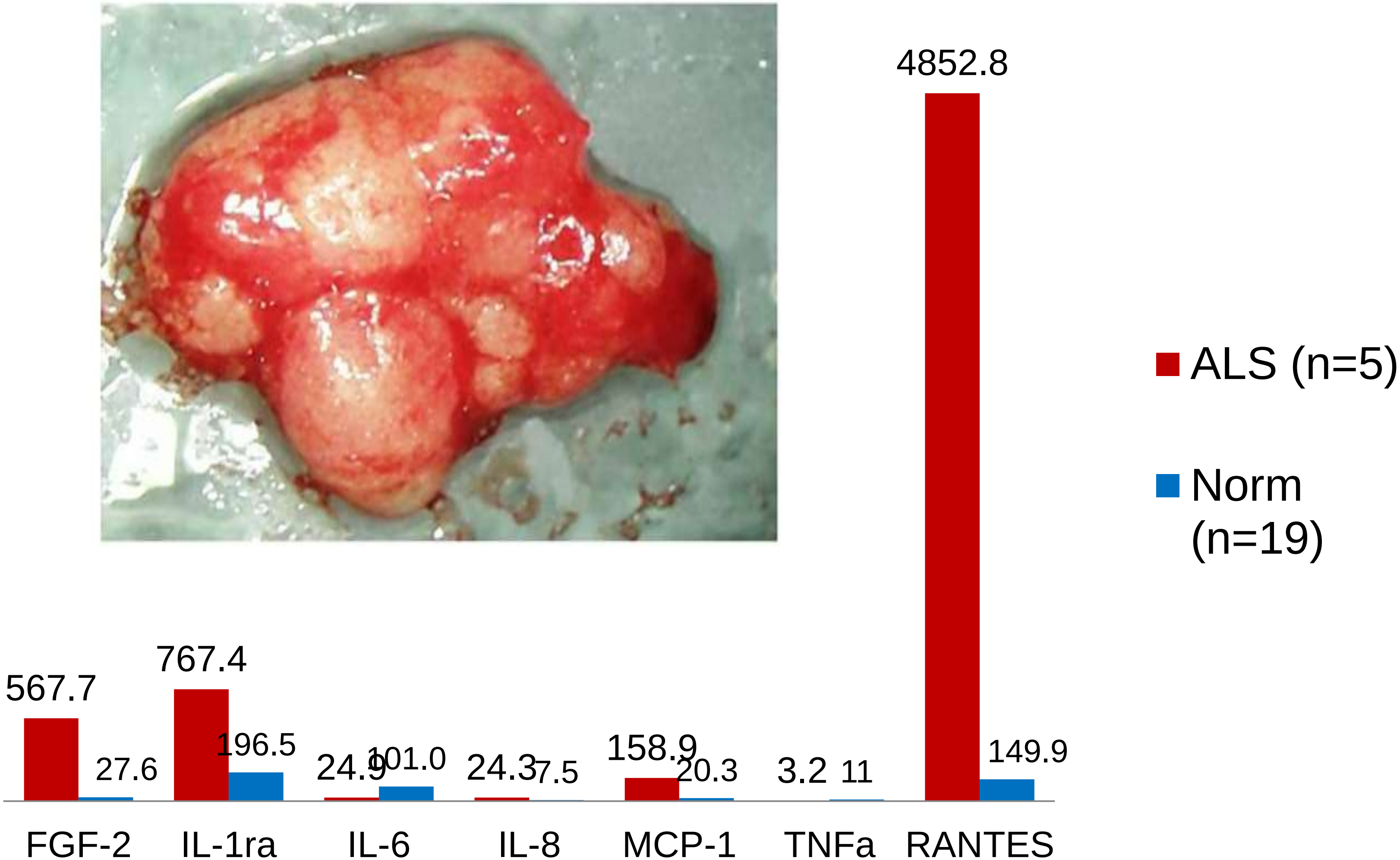
Patients with ALS had higher RANTES levels compared with the NoneIND patients and CTRL subjects in serum.

CSF RANTES levels were also higher compared with the NoneIND patients.

These results may suggest an activated microglia induced recruitment of peripheral inflammatory cells to sites of inflammation in ALS patients.

(Rentzos M, et al. RANTES levels are elevated in serum and cerebrospinal fluid in patients with amyotrophic lateral sclerosis. Amyotroph Lateral Scler. 2007 Oct;8(5):283-7.)

Comparision of 7 cytokines in ALS patientsn (n=5) in FDOJ and in normal jawbone marrow (n=19) in pg/ml



FDOJ – chronic inflammation in jawbone

a) FDOJ is characterized by fatty degenerative softening and osteolysis and osteonecrosis of jawbone

b) FDOJ is characterized by degeneration of adipocytes, metabolic disturbance and total lack of typical leukocytic inflammation

c) FDOJ is characterized biochemically by high levels of proinflammatory RANTES/CCL5 in comparision to normal jawbone.

d) FDOJ is characterized by absence of acute cytokines such as TNF-alpha and IL-6, which explains the painless and cryptic nature of FDOJ.

Data presented support our hypothesis:

- There are hyperactive signaling pathways through RANTES expression in jawbone cavitations

- FDOJ sites promote pathogenesis and metastasis of BC as a **silent inflammation**

- Surgical debridement of FDOJ in jawbone is eliminating RANTES sources

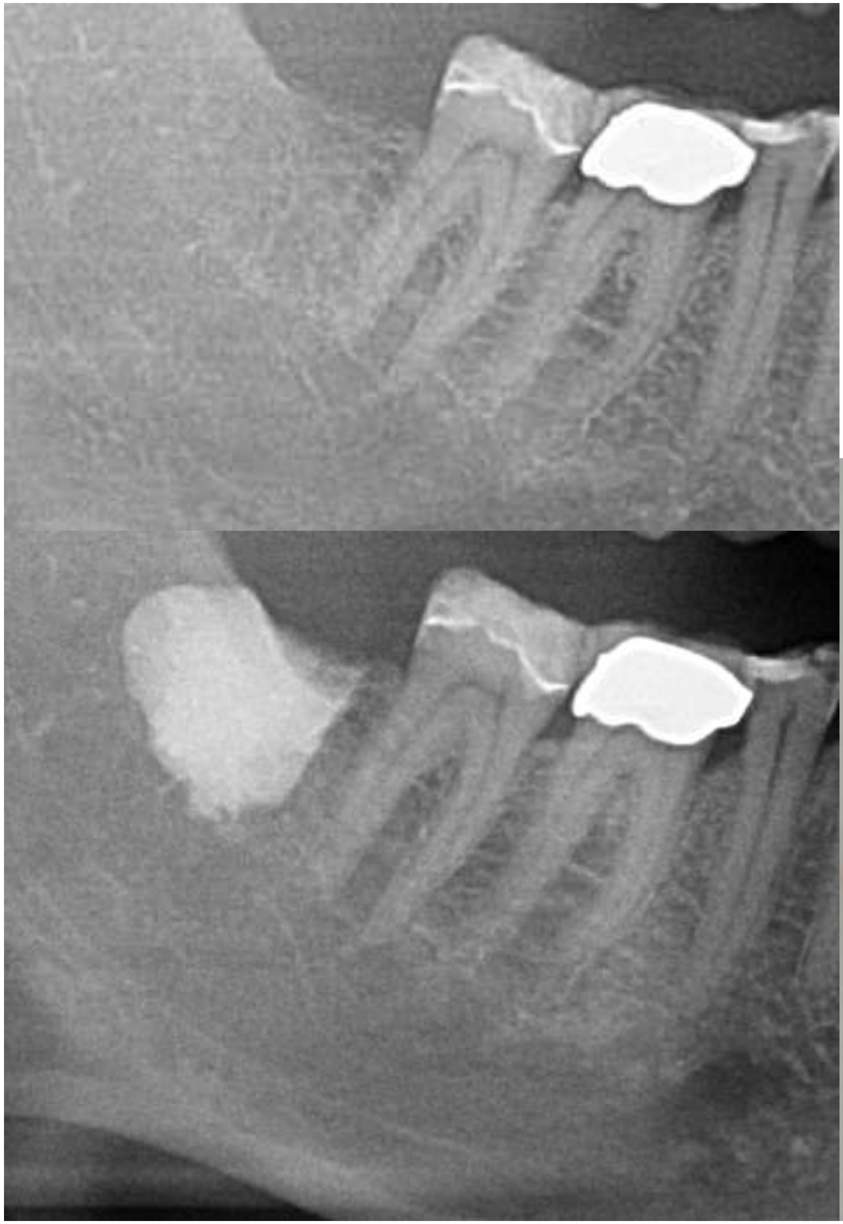
Why is FDOJ neclected

in dentistry?

Validation of dental X-ray by cytokine RANTES – comparison of X-ray findings with cytokine overexpression in jawbone

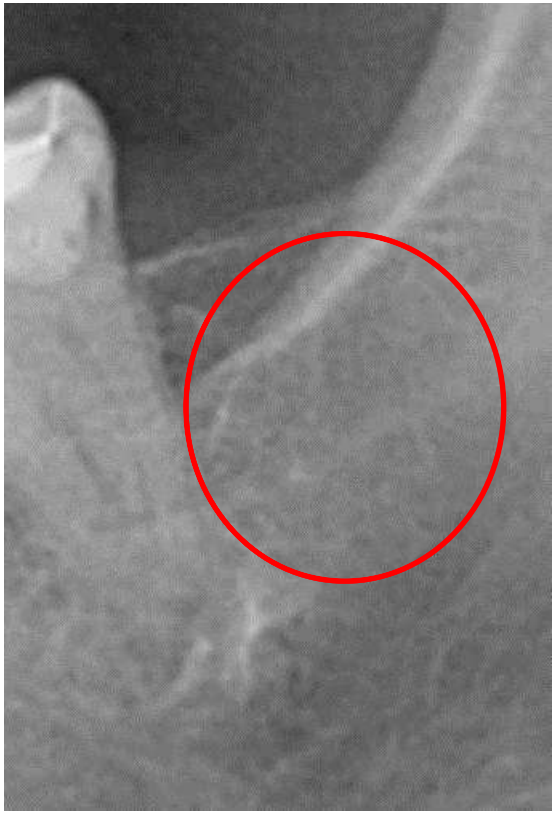
Link in PubMed: http://www.ncbi.nlm.nih.gov/pubmed/25170282

FDOJ sample: Bone marrow of jawbone changed to fatty-degenerative osteonecrosis

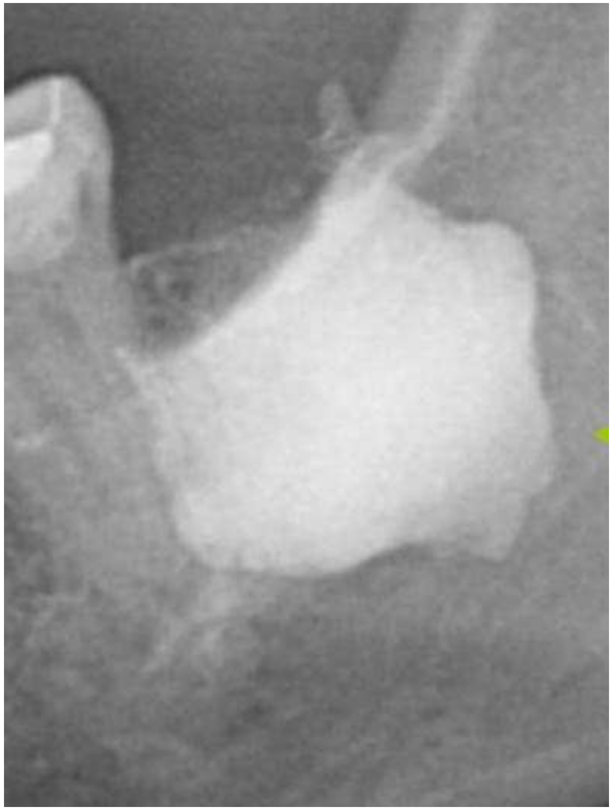


Praxisklinik Dr. med. dent.
Johann Lechner
Ganzheitliche Zahnheilkunde

Existence of FDOJ is neglected in dentistry because of diagnostic problems in x-rays

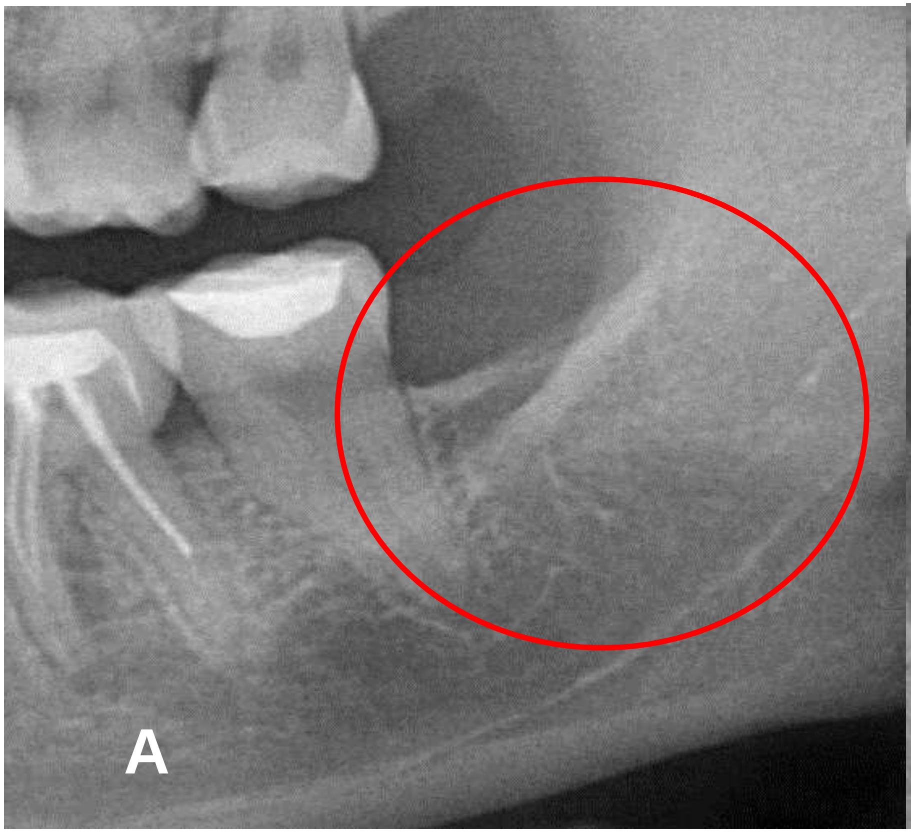


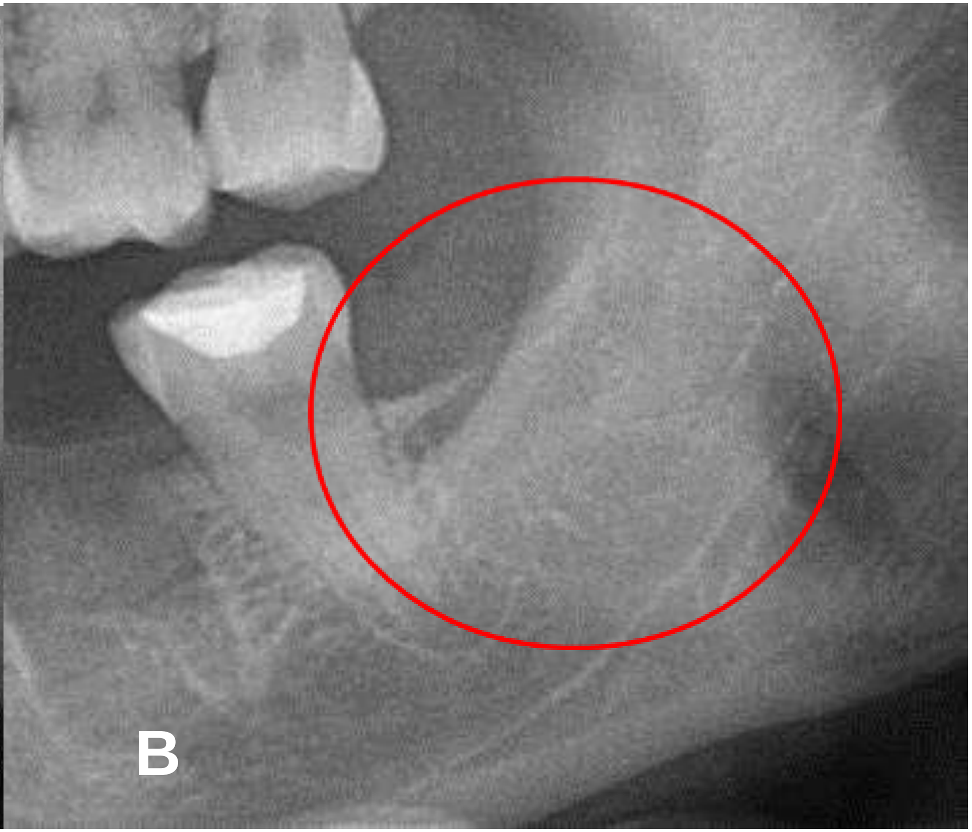
Inconspicuous retromolar area



Extent of softened bone marrow in retromolar area

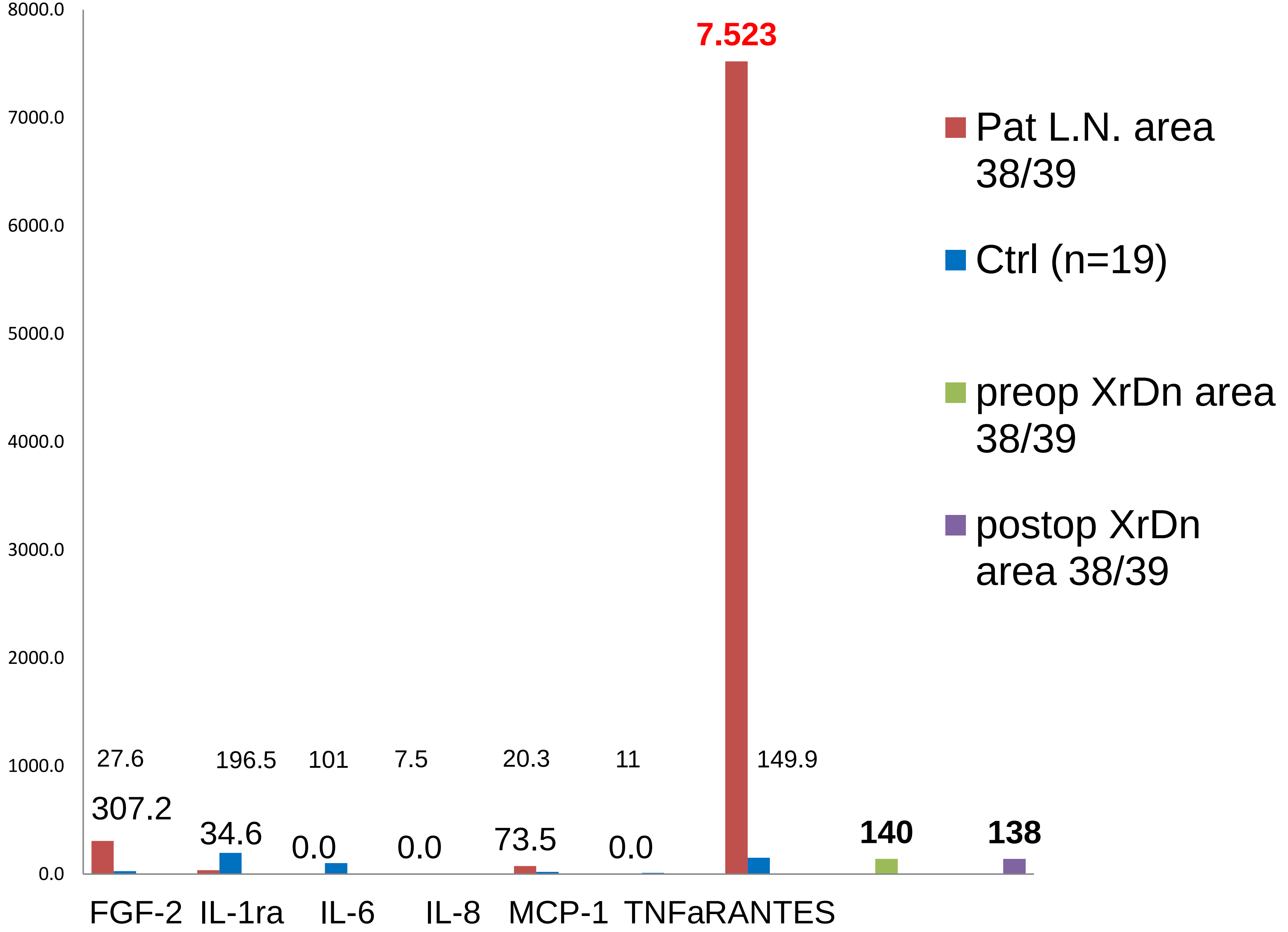
Sample of FDOJ in retromolar area





X-ray density area 38/39
preop = 140

X-ray density area 38/39
postop = 138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73.5
0.0
140
138
FGF-2
IL-1ra
IL-6
IL-8
MCP-1
TNFa
RANTES
Pat L.N. area 38/39
Ctrl (n=19)
preop XrDn area 38/39
postop XrDn area 38/39

How to detect and locate cavitations in jawbones?

Or: How to find

the source of chronic

overexpression of

RANTES in jawbone ?

Through-Transmission Alveolar Ultrasonography (TAU).

New TAU® generates an ultrasound pulse and passes the pulse through the jawbone.

The pulse is detected and monitored by an ultrasound receiving unit.

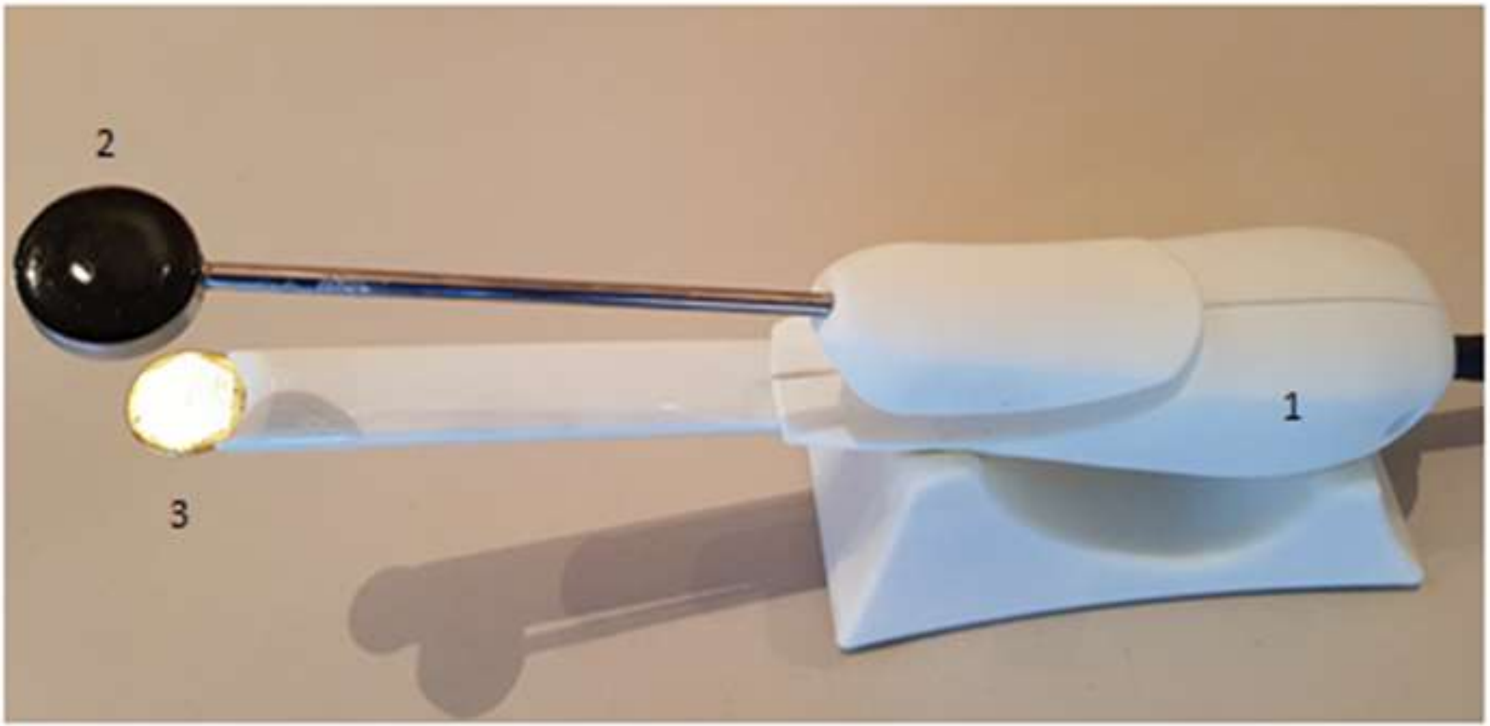
Attenuations of the amplitude of the pulse are indicative for pathological changes in the jawbone.

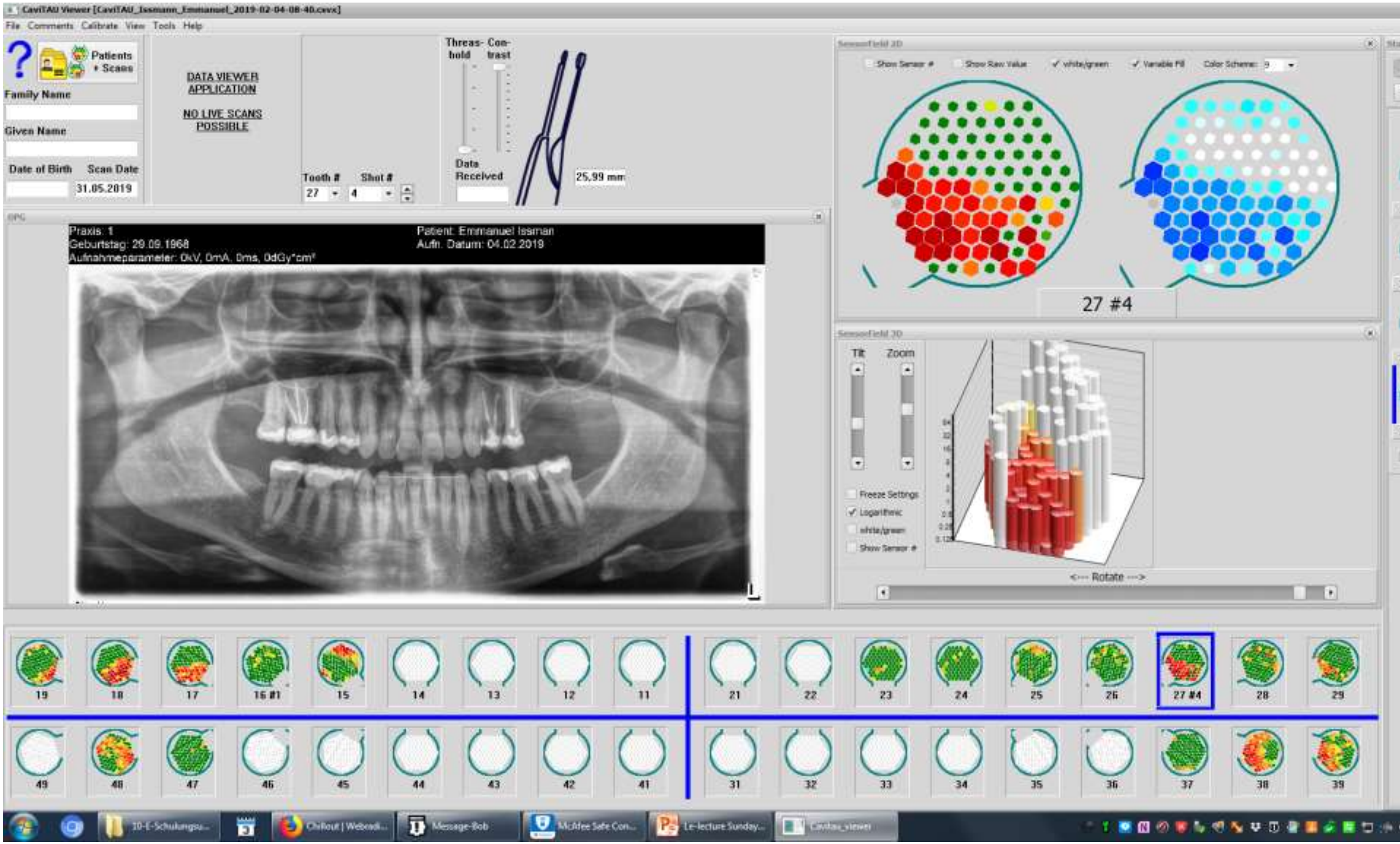
The results are displayed on a color monitor, showing different colors according to different degrees of attenuation.

CaviTAU®

1= Handpiece with Ultrasoundsender and -sensor unit

2= Ultrasound sender 3= Ultrasound receiver/sensor




CaviTAU Viewer [CaviTAU_Issmann_Emmanuel_2019-02-04-08-40.cevx]
File Comments Calibrate View Tools Help
Patients
Scans
Family Name
Given Name
Date of Birth
Scan Date
31.05.2019
DATA VIEWER APPLICATION
NO LIVE SCANS POSSIBLE
Tooth #
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27
4
Threas-hold
Con-trast
Data Received
25,99 mm
Praxis: 1
Geburtstag: 29.09.1968
Aufnahmeparameter: 0kV, 0mA, 0ms, 0dGy*cm²
Patient: Emmanuel Issman
Aufn. Datum: 04.02.2019
27 #4
Tilt
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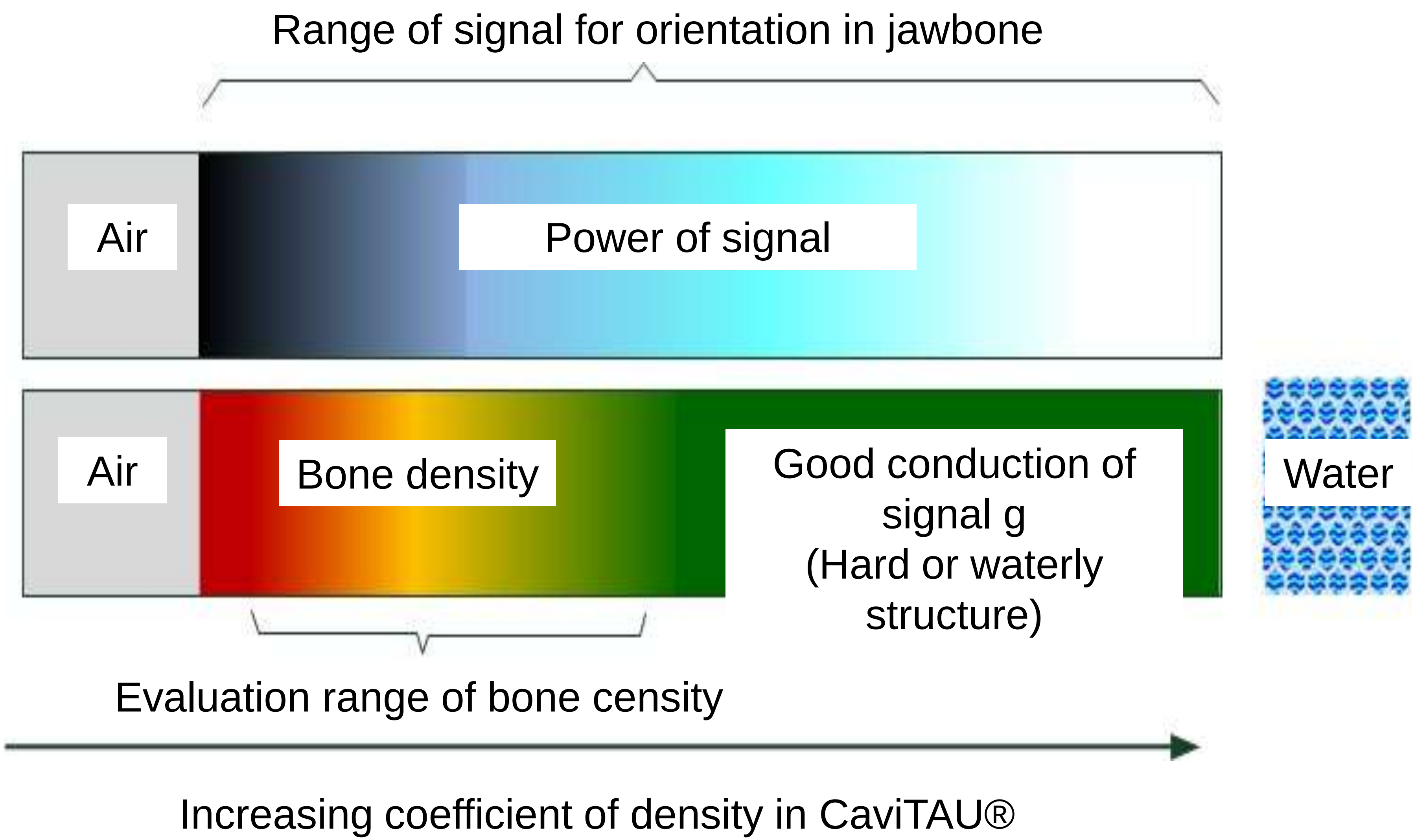
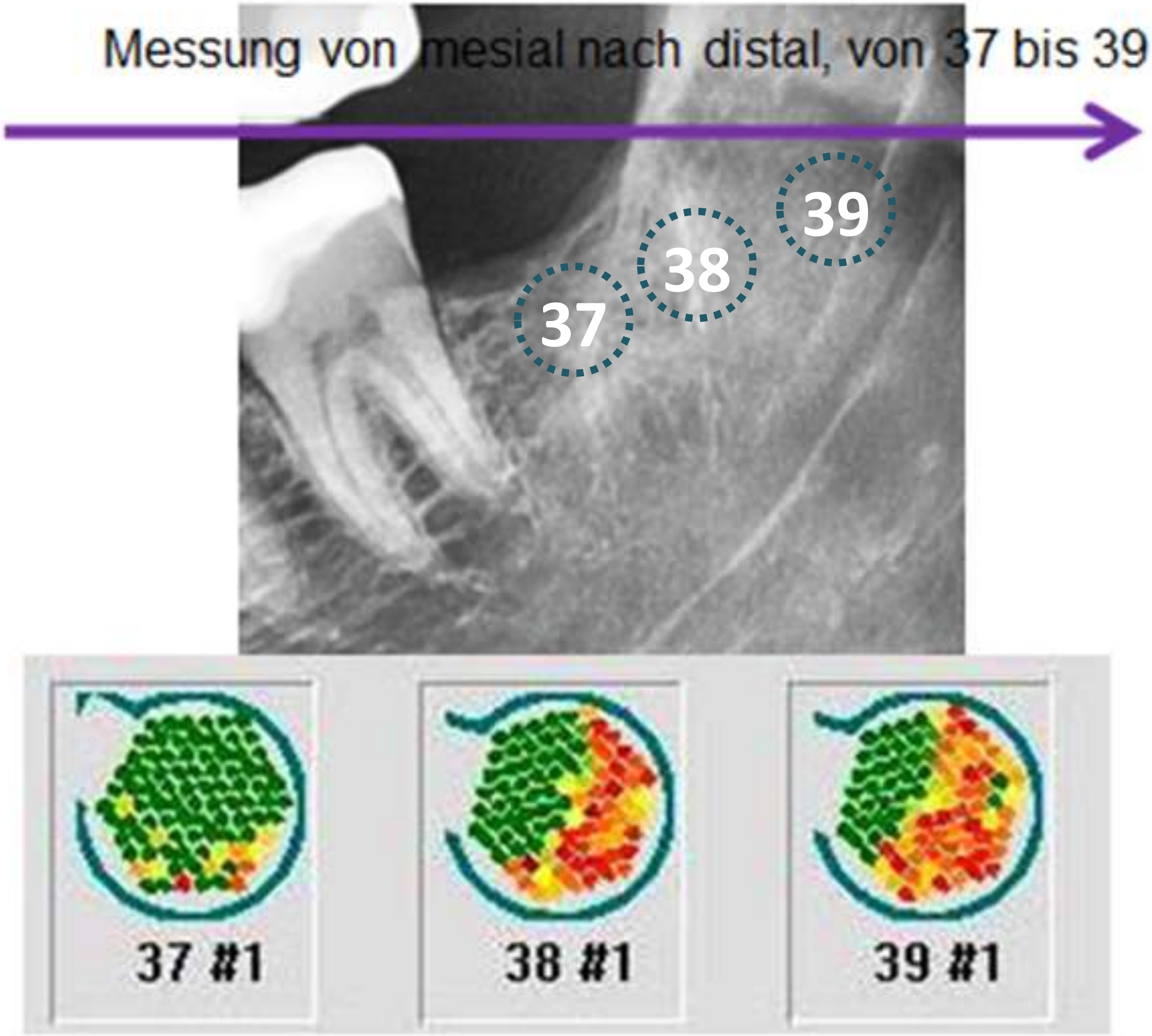
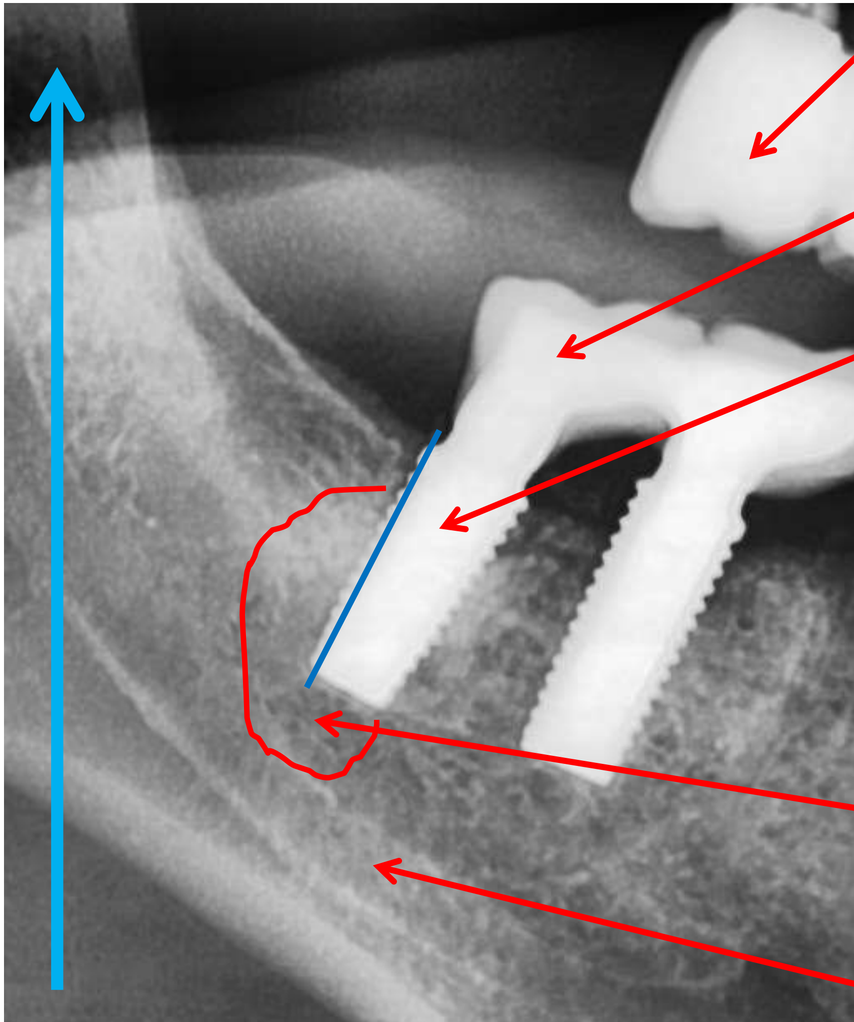
white/green
Show Sensor #
<--- Rotate --->
19 18 17 16 #1 15 14 13 12 11 21 22 23 24 25 26 27 #4 28 29
49 48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38 39

CaviTAU® red/geen-imaging of bone density




Messung von mesial nach distal, von 37 bis 39
37
38
39
37 #1
38 #1
39 #1



High density

Crown

Implant

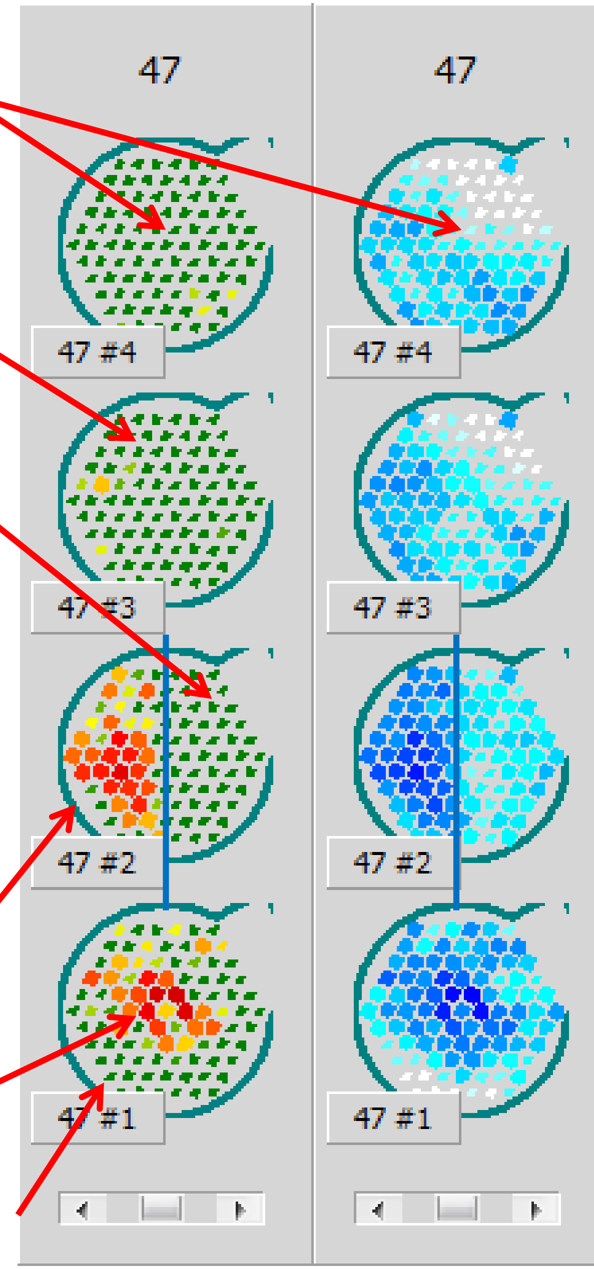
= straight border line to the implant

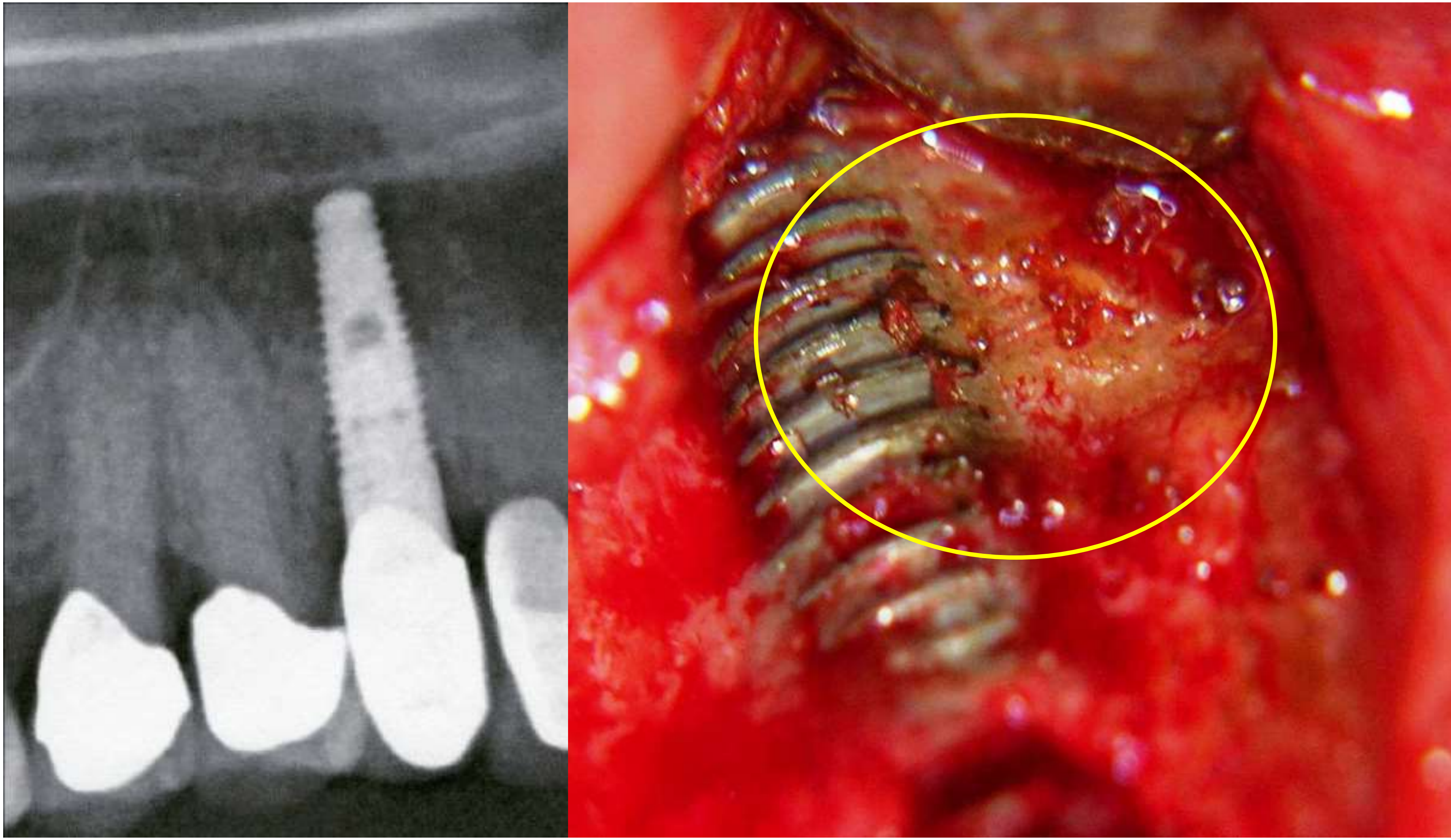
Dimminished bone density

Nerv canal less dense

Lower cortical rim

Direction of measuring (from caudal to cranial)





Lechner J, Noumbissi S, von Baehr V. Titanium implants and silent inflammation in jawbone – a critical interplay of dissolved titanium particles and cytokines TNF-a and RANTES/CCL5 on overall health? EPMA Journal (2018). https://doi.org/10.1007/s13167-018-0138-6

Take home messages

Collectively our data reveal a hitherto unknown function of **chronic inflammation in jawbone** promoting overexpression of **chemokine RANTES/CCL5**

The challenge posed by these discoveries is the need to raise awareness of **jawbone cavitations (FDOJ)** throughout the medical and dental community under the **integrative aspect of "silent inflammation".**

Interest in

trans-alveolar ultrasound device?

Please refer to
www.cavitau.de/ in English/ Newsletter
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Many thanks for your highly appreciated attention

Documentation of fatty-degenerative Osteonecrosis of the Jawbone (FDOJ) in patients with **Atypical Facial Pain/Trigeminal Neuralgia**

Own scientific literature:

Lechner J, von Baehr V. ***Peripheral Neuropathic Facial/Trigeminal Pain and RANTES/CCL5 in Jawbone Cavitation.*** Evid Based Complement Alternat Med. 2015;2015:582520. doi: 10.1155/2015/582520. Epub 2015 Jun 11. PMID: 26170877; PMCID: PMC4481083.

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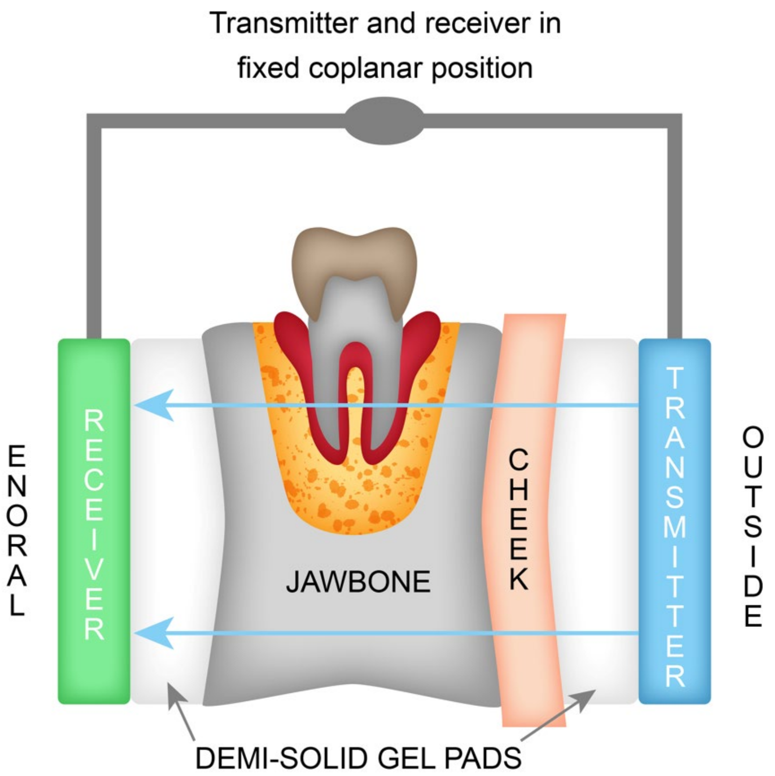

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➡ **chronic inflammation**
in diseases of the immune system

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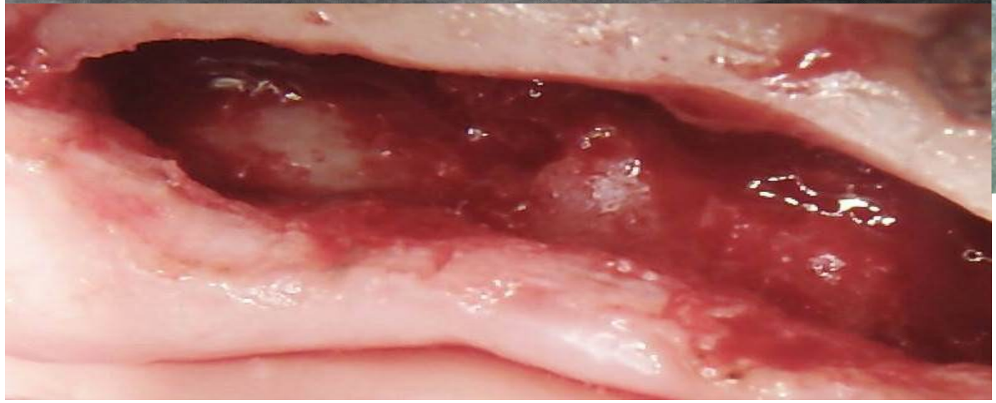
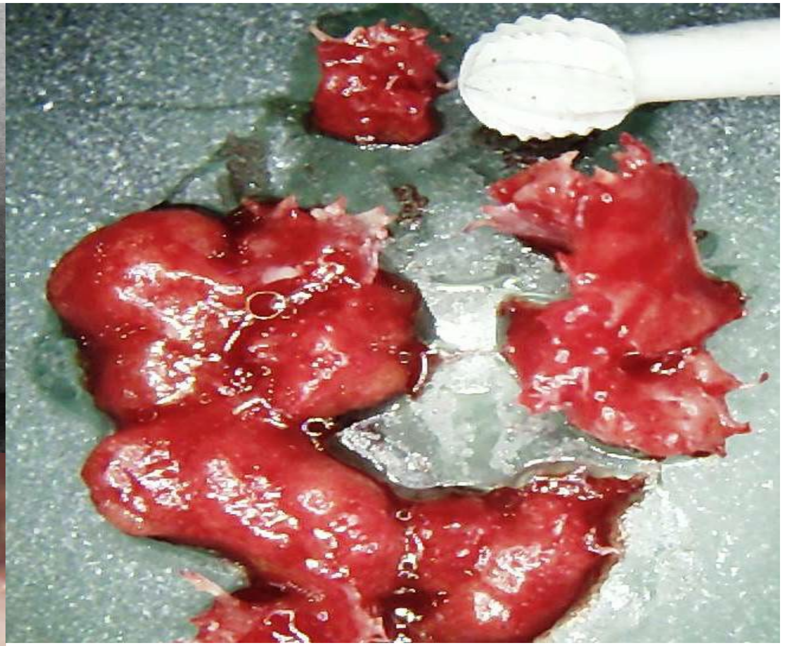
➡ **worldwide patent certificate**

Case #1:

Patient with an atypical pain in the left lower jaw for 7 years

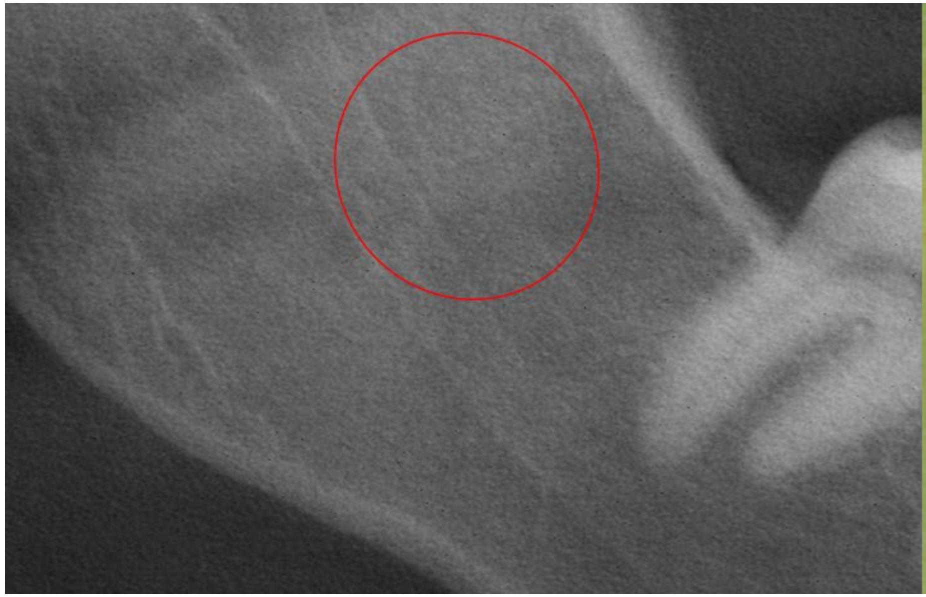


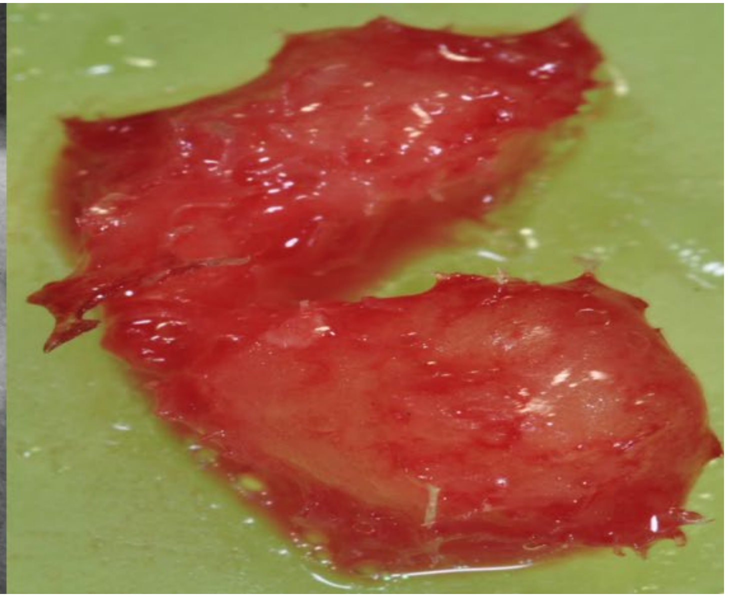


Examination regio 36-39: Vital bone tissue; medullary canals with fibrotic adipose tissue; increased tissue mast lines; trophic disturbances.

Case #1

Fall #2:



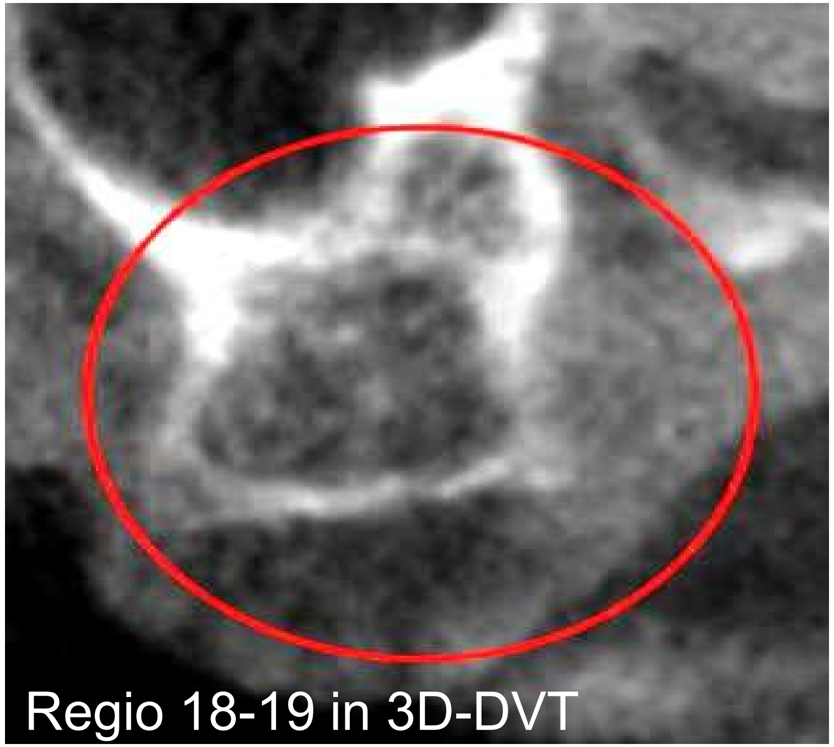


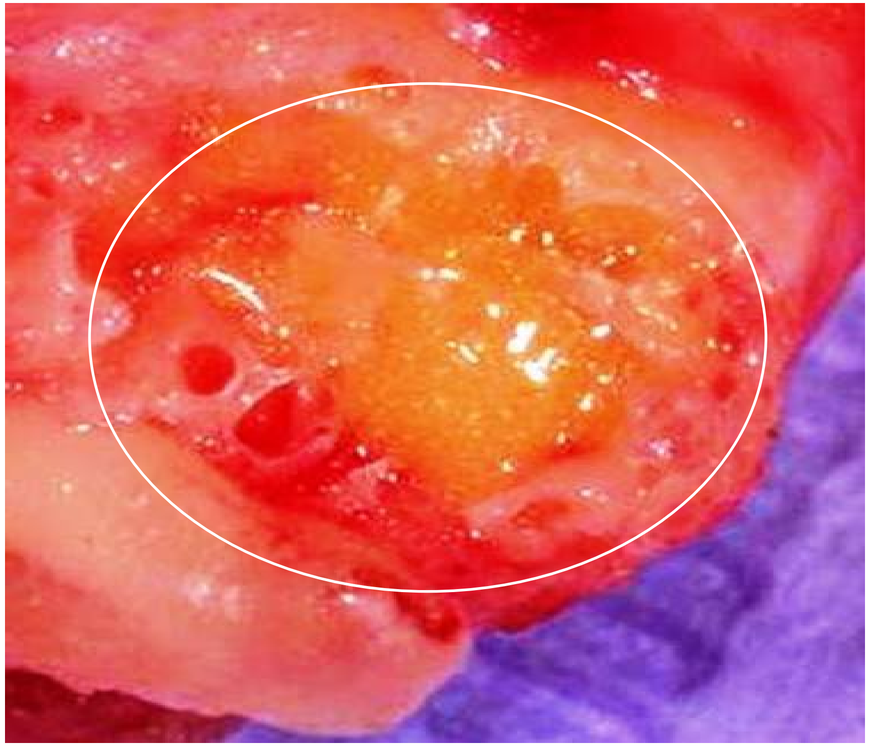
Assessment regio 48/49: Irregular, very delicate spongy bone tissue without evidence of actively increased bone remodelling. In medullary adipose tissue caliber variations of adipocytes and fibrillar as well as mucoid transformation of cytoplasmic contents; matching trophic disorders.

Case #2

Fall #3:

Atypicial facial pain in the right upper jaw for 3 years with neuroborreliosis



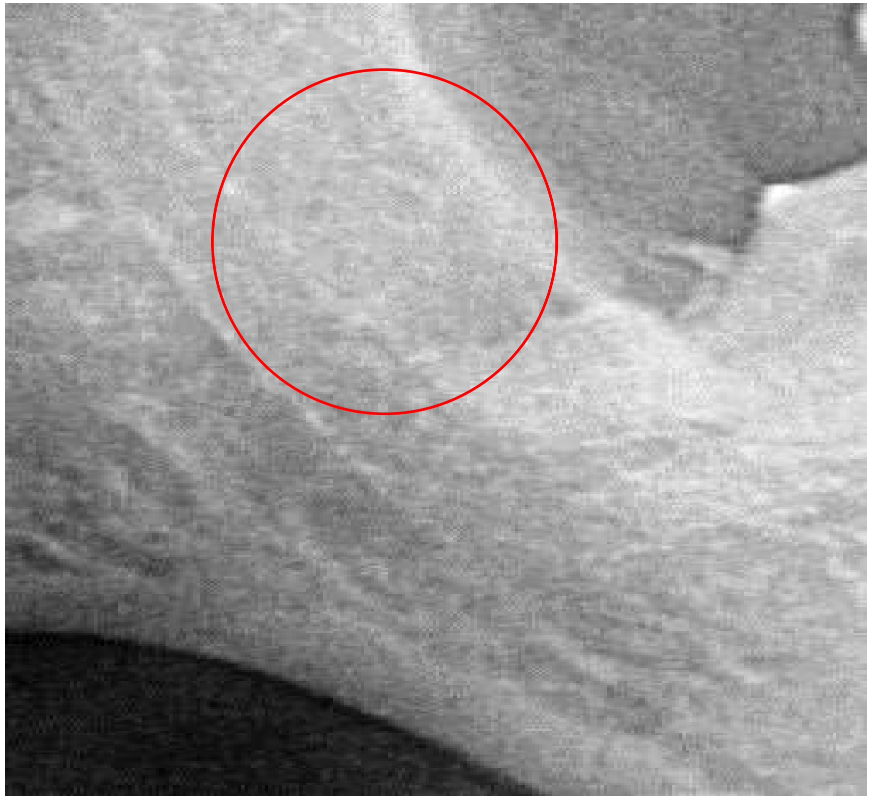


Examination of region 18/19: Vital spongy bone tissue; medullary canals fibrosed; **fat cells with marked degenerative damage** to the cytoplasmic content, marked calibre fluctuations of the adipocytes; **fibrillar degeneration;** trophic disturbances.

Case #3

Fall #4:

Attacks of neuralgia over the entire facial area for 5 years

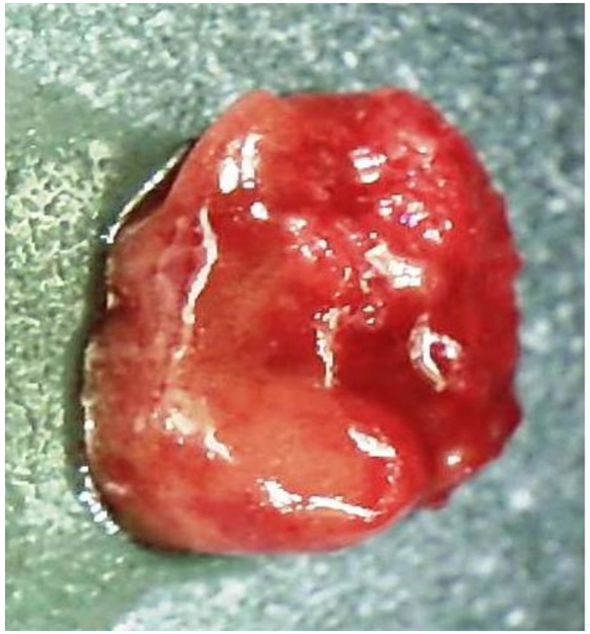


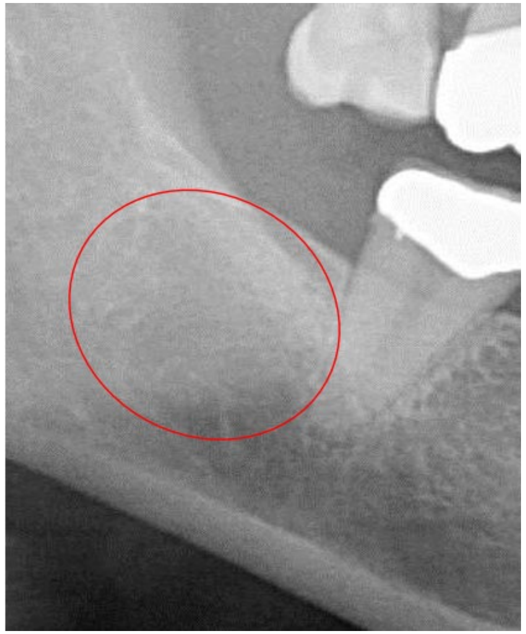
Assessment regio 48/49: In medullary canals fatty tissue with **degenerative damage; fibrillar degeneration** of cytoplasmic contents, consistent with trophic disturbances. **No inflammation**.

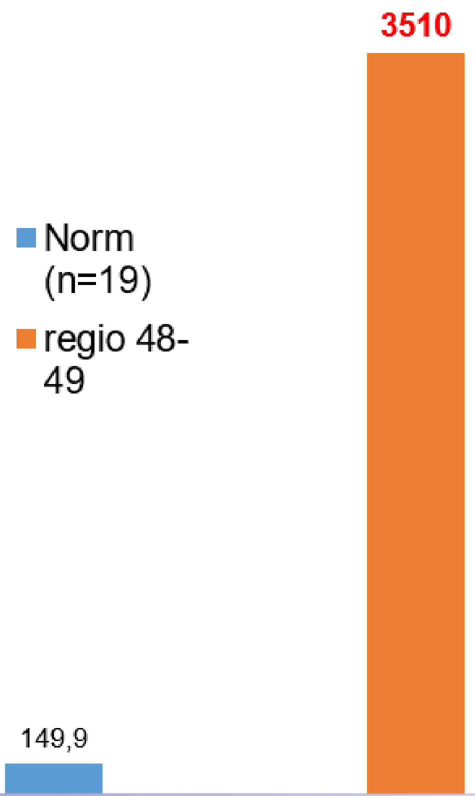
Case #4

Fall #5:

Patient with trigeminal neuralgia on the right side of the lower jaw for 7 years





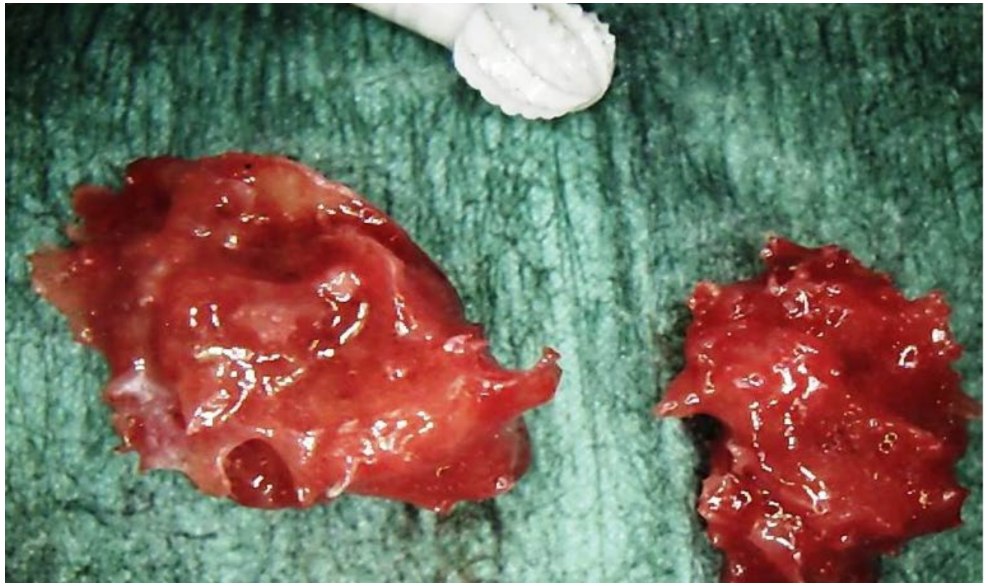


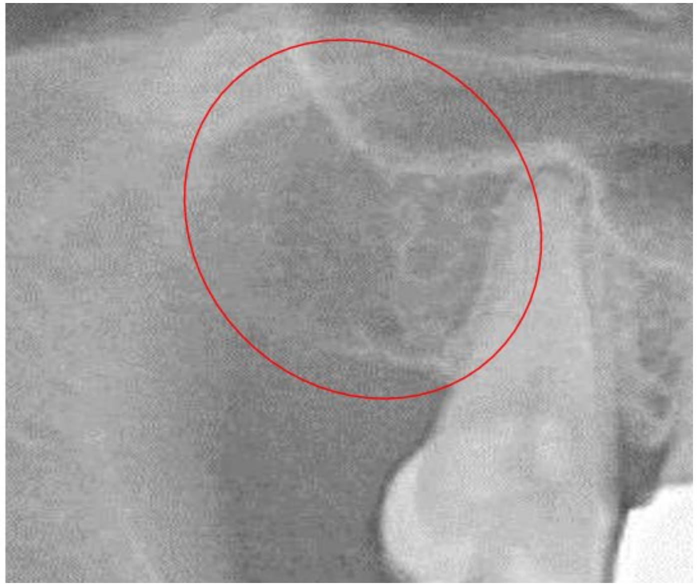
Assessment area 48/49: osteoporosis-like osteopenia; basophilic osseous without inhabited osteocyte cavities; intratrabecular fat marrow only present in remnants; sparsely recorded lymphoid cell nodules; **no expression of inflammation**; non-specific trauma sequelae.

Case #5

Fall #6:

Patient has been suffering from atypical facial pain in the right upper jaw for 6 years





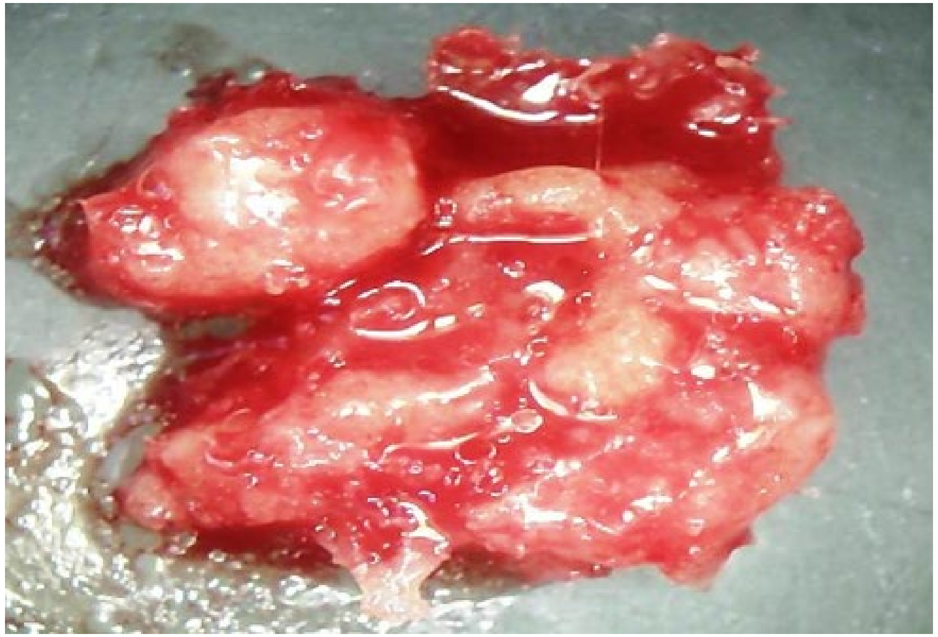
Assessment area 48/49: osteoporosis-like osteopenia; basophilic osseous without inhabited osteocyte cavities; intratrabecular fat marrow only present in remnants; sparsely recorded lymphoid cell nodules; **no expression of inflammation**; non-specific trauma sequelae.

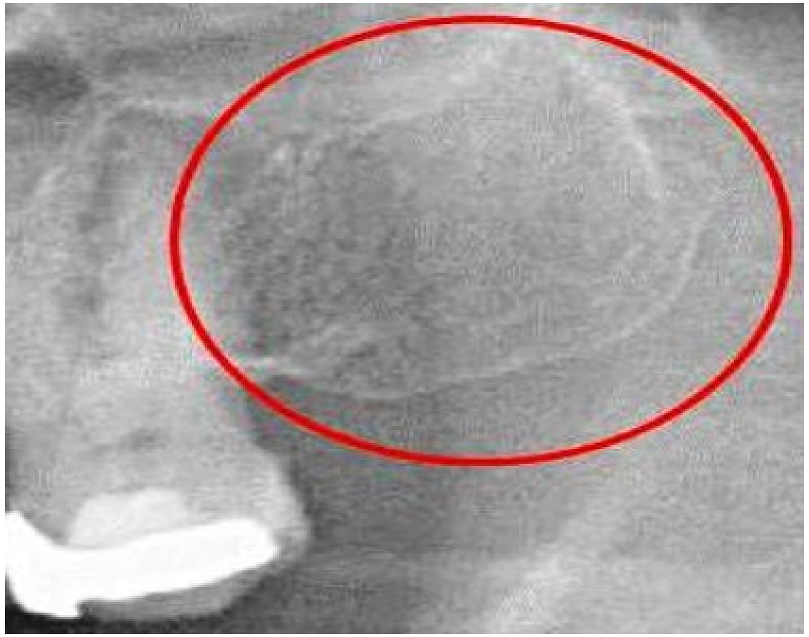
Case #6

Fall #7:

Praxisklinik Dr. med. dent.
Johann Lechner
Ganzheitliche Zahnheilkunde

Patient has been suffering from trigeminal neuralgia in the left upper jaw for 10 years

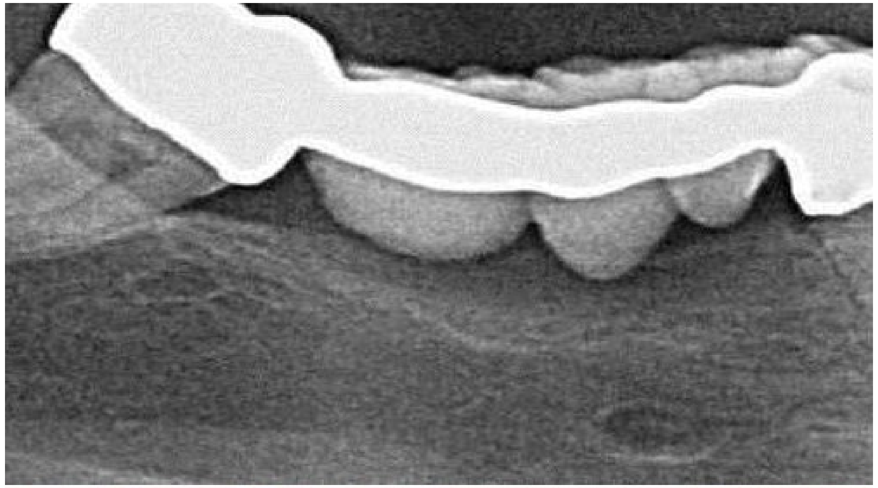




Assessment of area 18/19: medullary canal with unremarkable haematopoietic bone marrow; **fibrosed adipose tissue with myxoid transformation** of cytoplasmic contents; trophic disturbances.

Case #7

Fall #8:

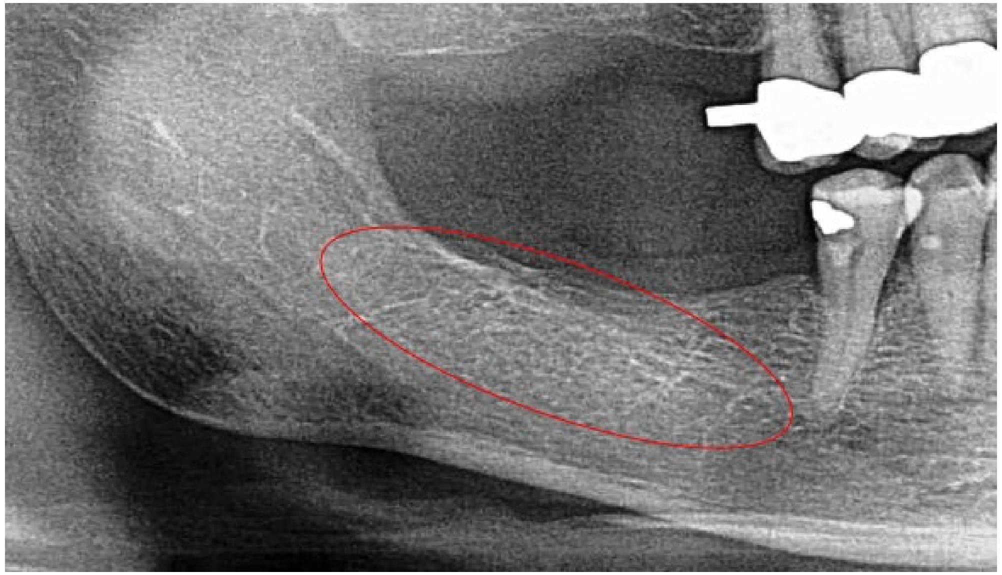


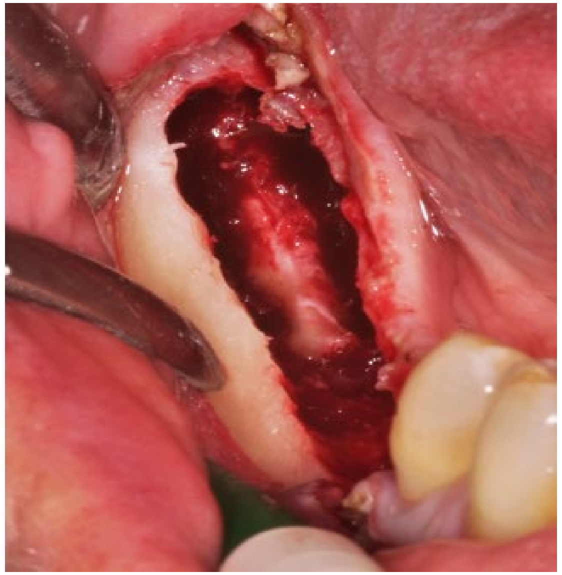
Assessment area 36/37:
Medullary canal with **myxoid or fibrillar de- generation** of cytoplasm; **peripheral nerve** with perineural sheath fibrosis (**pain symptomatology**?); focally increased proliferated capillaries.

Case #8

Fall #9:

Patient has been suffering from right mandibular trigeminal neuralgia for 4-5 years

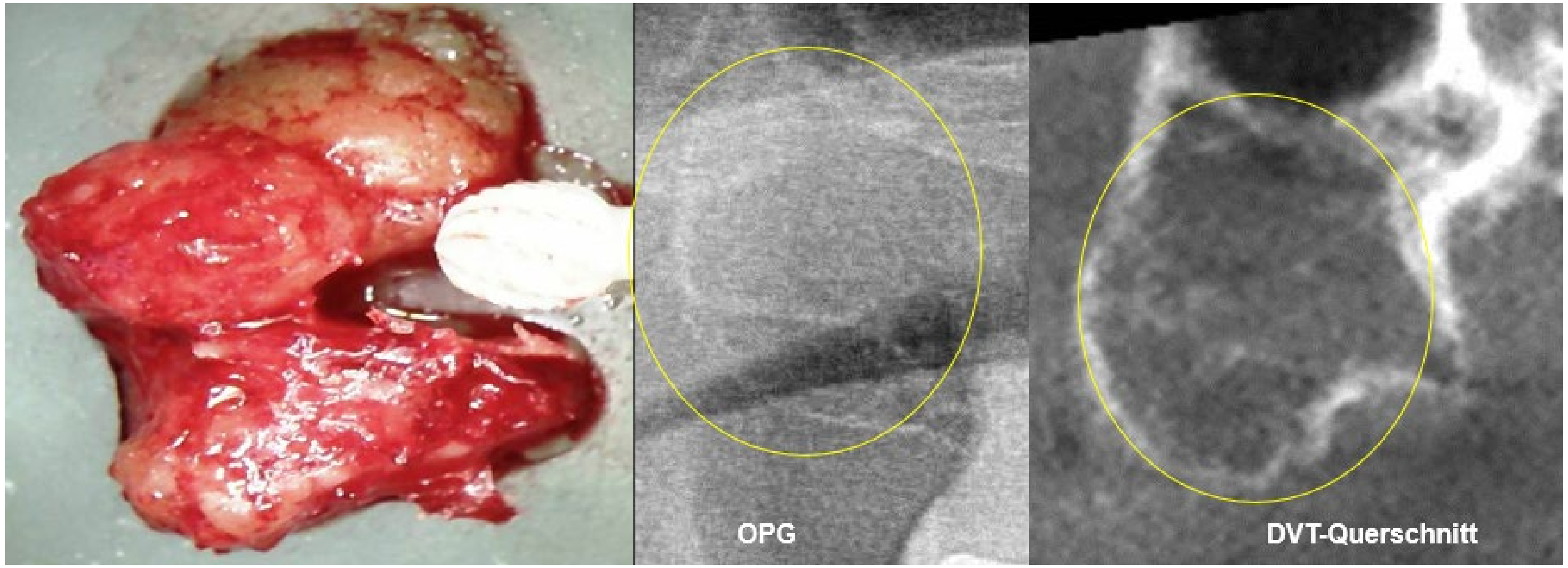




Assessment area 48/49:
Significantly reactive osteosclerotic widened vital bone tissue with little active bone remodelling. Bone tissue with little active bone remodelling. Fat cells with calibre fluctuatons; Fine **fibrillar or mucoid transformation** of the cytoplasmic space. Slightly increased of lymphocytes and mast cells in the manner of minor chronic osteitis.

Case #9

Fall #10:



Assessment area 18/19: Vital preserved bone bellows; intratrabecular **fat marrow with oedematous fine fibrillar interstitial matrix with degenerative** changes; blood vessels with fibrosed adventitia and reactive capillary proliferates and erythrocyte extravasations; **no inflammatory infiltrates or exudates**; trophic disturbance.

Case #10

Literature on RANTES/CCL5 and Atypical Facial Pain (selection)

- J. E. Bouquot, A. M. Roberts, P. Person, and J. Christian, “Neuralgia-inducing cavitational osteonecrosis (NICO): osteomyelitis in 224 jawbone samples from patients with facial neuralgia,” *Oral Surgery Oral Medicine and Oral Pathology*, vol. 73, no. 3, pp. 307–320, 1992.

- E. J. Ratner, B. Langer, and M. L. Evins, “Alveolar cavitational osteopathosis—manifestations of an infectious process and its implication in the causation of chronic pain,” *Journal of Periodontology*, vol. 57, no. 10, pp. 593–603, 1986.

- L. M. Bolin, R. Murray, N. W. Lukacs et al., “Primary sensory neurons migrate in response to the chemokine RANTES,” *Journal of Neuroimmunology*, vol. 81, no. 1-2, pp. 49–57, 1998.

- N. Kiguchi, Y. Kobayashi, and S. Kishioka, “Chemokines and cytokines in neuroinflammation leading to neuropathic pain,” *Current Opinion in Pharmacology*, vol. 12, no. 1, pp. 55–61, 2012.

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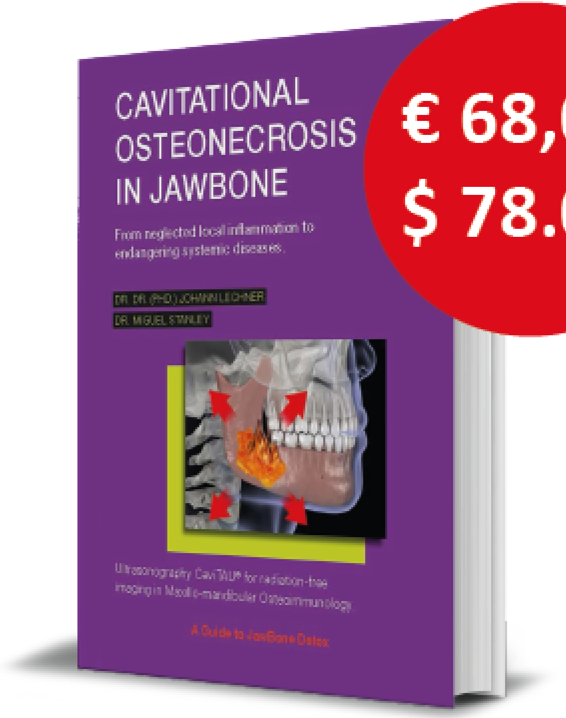

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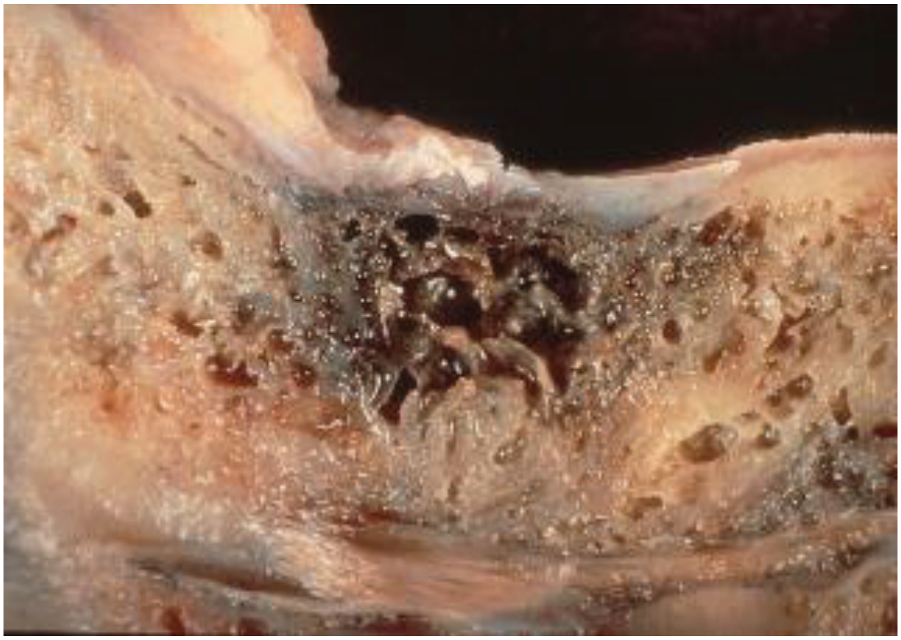

What is a Cavitation?

A cavitation is a hole in the bone, usually where a tooth has been removed, and the bone has not healed/filled in properly. It is an area of osteonecrosis (dead bone), that has a sponge-like quality of very low bone-density.

What's Hiding Inside?

Inside a cavitation, anaerobic bacteria flourish and deviant cells multiply. Cavitations act as a breeding ground for bacteria and their toxins. Research has shown these bacterial waste products are extremely potent and result in digestion problems, chronic fatigue, general feeling of malaise, and other chronic health problems. They often have high levels of *Rantes (CCL-5),* a protein that has been linked to cancer, MS, Parkinson's etc, etc in recent studies. Cavitations can also cause blockages on the body's energy meridians and can exert far-reaching impact on the overall system. Investigation has revealed that some cavitations are reservoirs of huge amounts of mercury. Cavitations may be a source of low-level or high-level stress on the entire body.

How do we fix them?

Traditionally, these are corrected by surgical intervention where they are debrided, cleaned with laser, ozone, ultrasonic, etc. Then **a-PRF** is placed, which is a supercharged healing clot made from the patients own blood, then held in place with dissolvable sutures.

There is an alternative treatment using Nd:Yag laser to non-surgically treat the affected area 2-3 times over a period of a few months. This method has shown great promise and many patients have felt a noticeable difference in how they feel afterwards. However, there is no long-term data nor research done on this method and currently I am one of 2 or 3 dentists in the country using this technique.

Tooth-Organ Meridian Chart

SUMMIT VIEW
BIOLOGICAL DENTISTRY & WELLNESS
Scott M. Chandler, DMD | Matthew D. Geddes, DDS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sense Organs	Inner Ear	Maxillary Sinus		Ethmoid Cells		Eye	Frontal Sinus		Frontal Sinus		Eye	Ethmoid Cells		Maxillary Sinus		Inner Ear
Joints	Shoulder Elbow	Jaws		Shoulder Elbow		Back of Knee			Back of Knee			Shoulder Elbow		Jaws		Shoulder Elbow
						Hip	Sacrococcyx		Sacrococcyx		Hip					
	Hand, Ulnar Foot, Plantar Toes, Sacro-iliac Joint	Front of Knee		Hand, Radial Foot Big Toe		Foot			Foot			Hand, Radial Foot Big Toe		Front of Knee		Hand, Ulnar Foot, Plantar Toes, Sacro-iliac Joint
Spinal Segments	C8 T1 T5 T6 T7 S1 S2 S3	T11 T12 L1		C5 C6 C7 T2 T3 T4 L4 L5		T8 T9 T10	L2 L3 S4 S5 Coccyx		L2 L3 S4 S5 Coccyx		T8 T9 T10	C5 C6 C7 T2 T3 T4 L4 L5		T11 T12 L1		C8 T1 T5 T6 T7 S1 S2 S3
Vertebrae	C7 T1 T5 T6 S1 S2	T11 T12 L1		C5 C6 C7 T2 T3 T4 L4 L5		T9 T10	L2 L3 S3 S4 S5 Coccyx		L2 L3 S3 S4 S5 Coccyx		T9 T10	C5 C6 C7 T2 T3 T4 L4 L5		T11 T12 L1		C7 T1 T5 T6 S1 S2
Organs	Heart-R	Pancreas		Lung-R		Liver-R	Kidney-R		Kidney-L		Liver-L	Lung-L		Spleen		Heart-L
	Duodenum	Stomach-R		Large Intestine-R		Gall-blad-der	Bladder-R Urogenital Area		Bladder-L Urogenital Area		Bile Ducts -L	Large Intestine-L		Stomach-L		Jejunum Ileum-L
Endocrine Organs	Pituitary, Ant. Lobe	Para-thy-roid	Thy-roid	Thy-mus	Pituitary, Post Lobe		Pineal Gland		Pineal Gland		Pituitary, Post Lobe		Thy-mus	Thy-roid	Para-thy-roid	Pituitary, Ant. Lobe
Others	CNS Psyche	Mammary Gland-R												Mammary Gland-L		CNS Psyche
Upper Teeth	R															L

	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Lower Teeth	R															L
Others	Energy Metabolism			Mammary Gland-R								Mammary Gland-L				Energy Metabolism
Endocrine Glands Tissue System	Peripheral Nerves	Ar-teries	Veins	Lymph Vessels	Gonad (Testes or Overy)		Adrenal Gland		Adrenal Gland		Gonad (Testes or Overy)		Lymph Vessels	Veins	Ar-teries	Peripheral Nervous System
Organs	Ileum-R	Large Intestine-R		Stomach-R Pylorus		Gall-blad-der	Bladder-R Urogenital Area		Bladder-L Urogenital Area		Bile Ducts -L	Stomach-L		Large Intestine-L		Jejunum Ileum-L
	Ileocecal Region															
	Heart-R	Lung-R		Pancreas		Liver-R	Kidney-R		Kidney-L		Liver-L	Spleen		Lung-L		Heart-L
Vertebrae	C7 T1 T5 T6 S1 S2	C5 C6 C7 T2 T3 T4 L4 L5		T11 T12 L1		T9 T10	L2 L3 S3 S4 S5 Coccyx		L2 L3 S3 S4 S5 Coccyx		T9 T10	T11 T12 L1		C5 C6 C7 T2 T3 T4 L4 L5		C7 T1 T5 T6 S1 S2
Spinal Segments	C8 T1 T5 T6 T7 S1 S2 S3	C5 C6 C7 T2 T3 T4 L4 L5		T11 T12 L1		T8 T9 T10	L2 L3 S4 S5 Coccyx		L2 L3 S4 S5 Coccyx		T8 T9 T10	T11 T12 L1		C5 C6 C7 T2 T3 T4 L4 L5		C8 T1 T5 T6 T7 S1 S2 S3
Joints	Shoulder and Elbow			Front of Knee		Back of Knee			Back of Knee			Front of Knee		Shoulder and Elbow		
	Hand, Ulnar Foot, Plantar Toes, Sacro-iliac Joint	Hand, Radial Foot Big Toe				Hip	Sacrococcyx		Sacrococcyx		Hip			Hand, Radial Foot Big Toe		Hand, Ulnar Foot, Plantar Toes, Sacro-iliac Joint
				Jaws		Foot			Foot			Jaws				
Sense Organs	Ear	Ethmoid Cells		Maxillary Sinus		Eye	Frotal Sinus		Frotal Sinus		Eye	Maxillary Sinus		Ethmoid Cells		Ear