Osteology Foundation

Experimental peri-implantitis induces neuroinflammation: An exploratory study in rats

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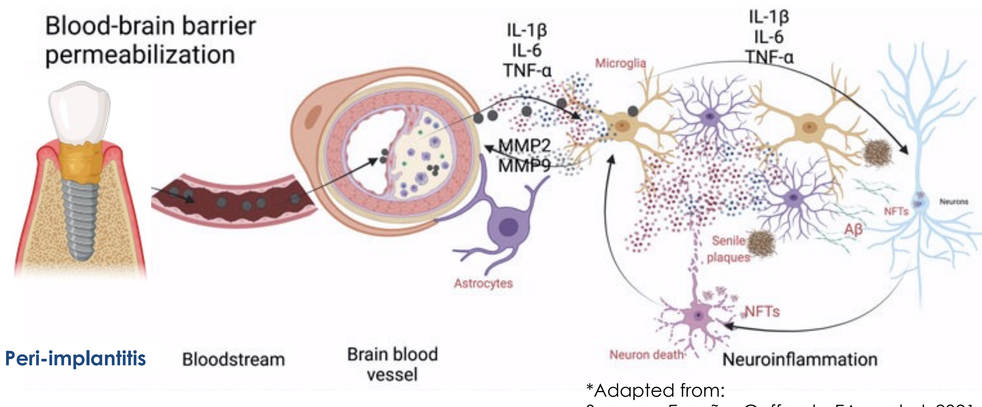
Background



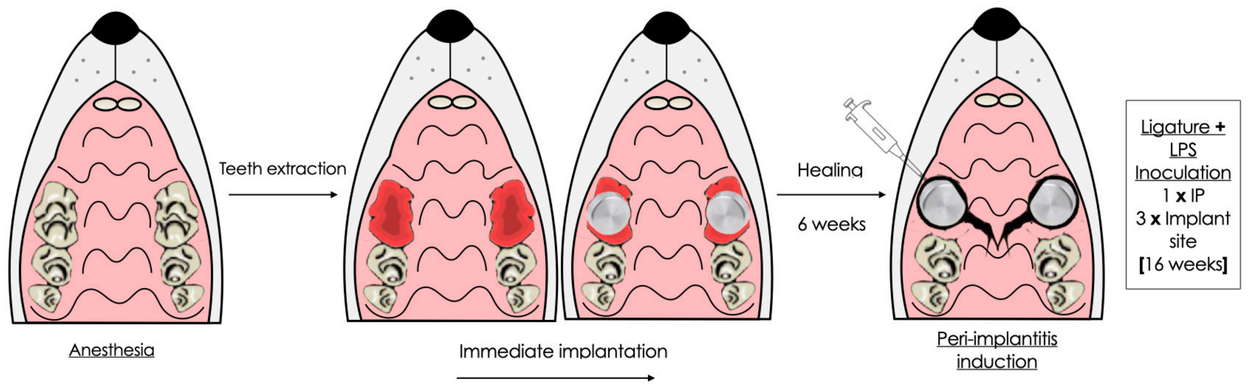
*Adapted from:
Sansores-España, Cafferata EA … et al. 2021

Hypothesis:
Chronic inflammation and dysbiosis during **peri-implantitis** can cause systemic inflammation and bacteremia, which are closely associated to **neuroinflammation** that leads to the onset of **neurodegenerative** pathologies like Alzheimer's disease. However, there is **no evidence yet**.

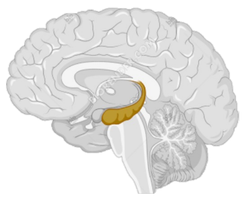
Aim:
This study aimed to investigate the possible **association** between ligature-induced **PI** and **neuropathological changes in the brain** in a rat model

Methods

1. Chrronic peri-implantitis lesion model



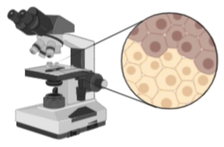
2. Cerebral tissue analyses



Brain [Hippocampus]

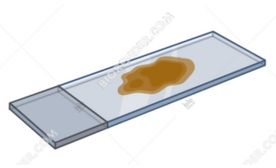
Peri-implantitis
Vs
Control

Immunohistochemistry



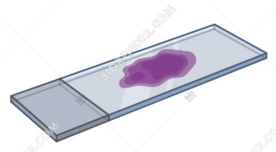
TNF-α
IL-6
H&E
Amyloid-β

Neuroinflammation



TNF-α / IL-6
Positive cells

Neurodegeneration



Pyknotic cells
Aβ plaques

Results

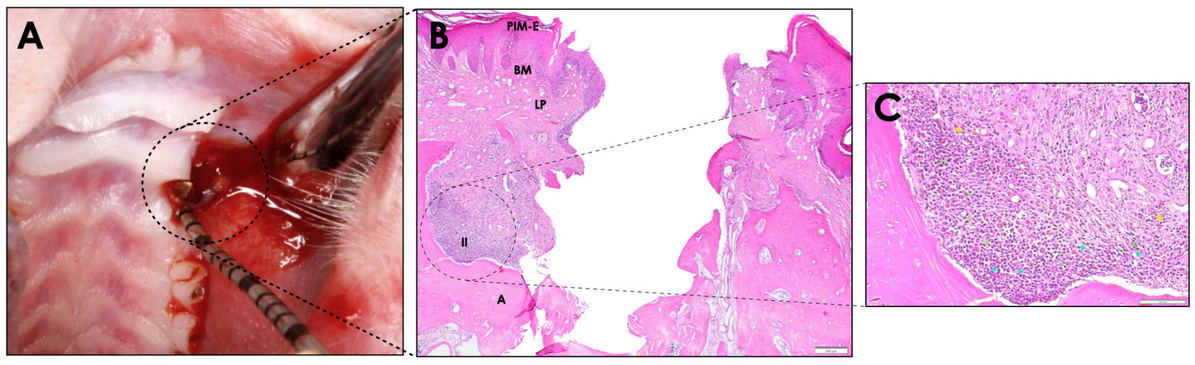


Figure 1. Experimental peri-implantitis. **A**) Clinical signs of inflammation were evidenced by the presence of bleeding on probing and suppuration at ligature removal. **B**) Representative H&E staining of an experimental peri-implantitis lesion [10x]. **C**) [20x] augmentation on **B** showing PI lesion inflammatory infiltrate, with the presence of polymorphonuclears, monocytes and some lymphocytes. PIM-E: peri-implant mucosa epithelium; BM: basal membrane; LP: lamina propia; II: inflammatory infiltrate; AB: alveolar bone.

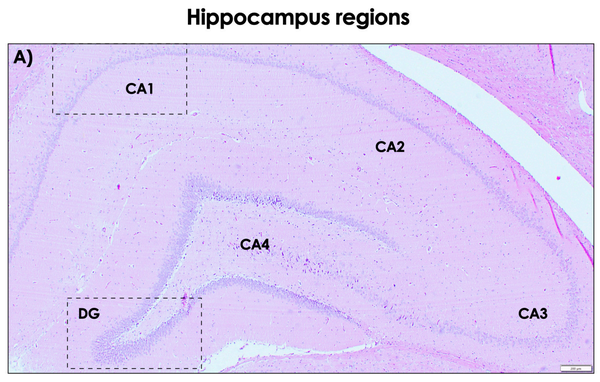


Figure 2A. Hippocampus showing cellular morphological alterations following experimental PI. A) Representative image showing the hippocampus regions -CA1, CA2, C3, CA4 and DG-, the regions of interest CA1 and DG are delimited by dashed squares [5x]

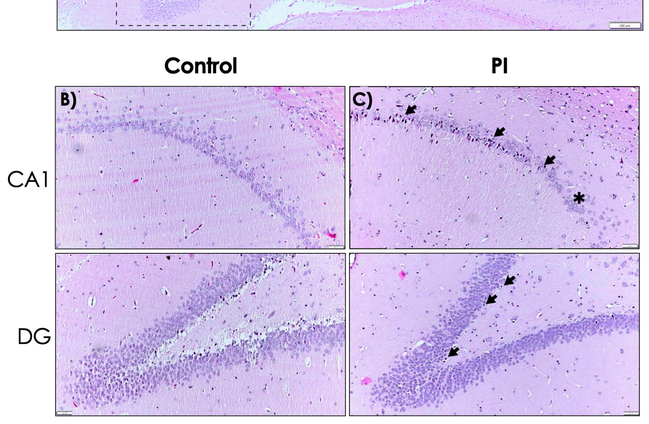


Figure 2B and C. Hippocampus showing cellular morphological alterations following experimental PI. **B**) Representative images of the CA1 and DG hippocampus regions of the control group [10x] and **C**) the peri-implantitis group, showing morphologically altered neurons and glial cells [10x]. CA: Cornu ammonis; DG: dentate gyrus; PI: peri-implantitis group; î: pyramidal neuron; →: astrocyte.

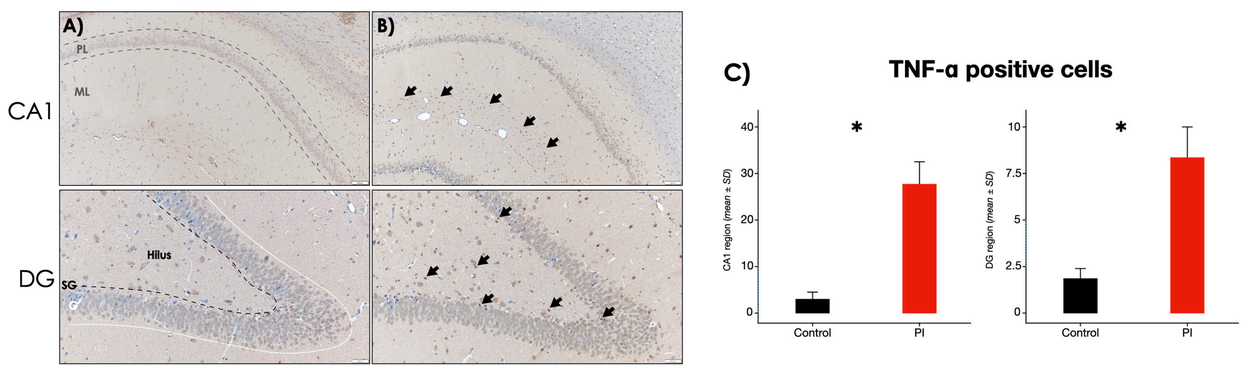


Figure 3. Hippocampus TNF-α immunostaining. (**A, B**) Representative hippocampus images showing the CA1 and DG regions [10x]. **C**) Relative quantification of TNF-α + cells in the CA1 and DG regions of the hippocampus. *p < 0.05. PL: pyramidal layer; ML: molecular layer; SG: subgranular cell zone; G: granular cell zone; → : TNF-α positive cell.

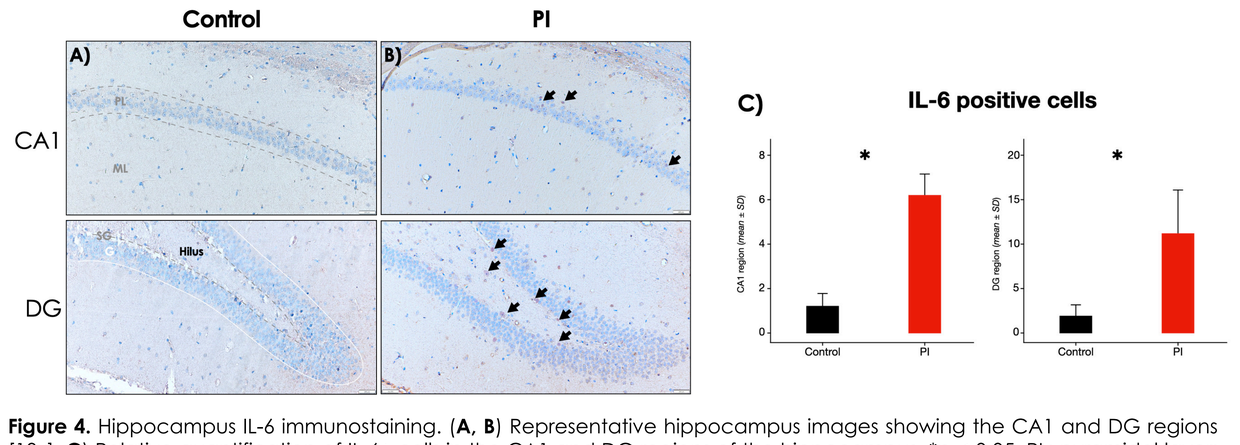


Figure 4. Hippocampus IL-6 immunostaining. (**A, B**) Representative hippocampus images showing the CA1 and DG regions [10x]. **C**) Relative quantification of IL-6+ cells in the CA1 and DG regions of the hippocampus. *p < 0.05. PL: pyramidal layer; ML: molecular layer; SG: subgranular cell zone; G: granular cell zone; → : IL-6 positive cell.

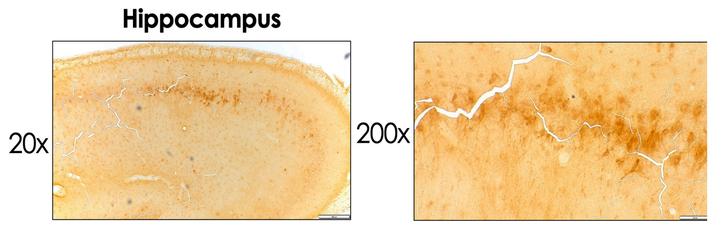


Figure 5. Representative hippocampus Aβ immunostaining. No Aβ positive immunostaining could be detected in any of the specimens.

Conclusion

- Within the limitations of the present experimental exploratory study, our analysis showed that chronic peri-implantitis lesions led to the increased detection of IL-6 and TNF-α in the hippocampus, showing neuroinflammatory signs associated with neurodegenerative disorders, such as Alzheimer's disease.

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