MACAQUE ATTACK: The association between dental pathologies and temporomandibular osteoarthritis in *Macaca fascicularis*

https://en.wikipedia.org/wiki/Crab-eating_macaque

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Introduction

Testing how pathological changes to the dentition might be associated with temporomandibular joint (TMJ) pathology will improve our understanding of masticatory function and dysfunction. Pathology rates are well documented for humans [1-5], and some other primate species [6], but not for *Macaca fascicularis*. Previous work in this vein has not addressed species-level trends [7], or has investigated rhesus macaques (or possibly not distinguished between *M. mulatta* versus *M. fascicularis*) [8,9]. This is the first quantitative examination of a variety of oral pathologies in wild long-tailed macaques as well as the first to relate oral and TMJ pathologies.

Materials & Methods

84 complete *Macaca fascicularis* (36 females, 48 males) skulls were evaluated for TMJ osteoarthritis (OA), antemortem tooth loss, periodontal disease, dental caries, broken teeth, dental abscesses, tooth crowding/malocclusion, and other craniofacial traumata and pathologies using standard criteria [3,10]. Lesions of each type were recorded as present/absent if the animal exhibited at least one. Fisher's exact tests for differences between males and females as well as variation in pathology rates for animals with and without TMJ osteoarthritis were carried out in SPSS [11].

Hypotheses

1. As in humans, female macaques are more frequently affected by TMJ OA.
2. Animals affected by TMJ OA exhibit other dental pathologies at higher rates than animals unaffected by TMJ OA.

Results

TESTING HYPOTHESES

1. As in humans, female macaques are more frequently affected by TMJ OA. ➡ **NO**
   - In this sample, there were no differences in rates of lesions between males and females (p = 1.000-0.187).

2. Animals affected by TMJ OA exhibit other dental pathologies at higher rates than animals unaffected by TMJ OA. ➡ **YES**
   - Animals affected by TMJ OA likely experience higher rates of some dental pathologies (Table 1).

Table 1. There were significant differences in the occurrence of antemortem tooth loss, periodontal disease, broken teeth, and dental abscesses in animal with versus without TMJ osteoarthritis.

TMJ OA (n = 36 females, 48 males)		AMTL	Periodontal	Caries	Broken tooth	Abscess	Crowding	Trauma	Other path
No OA	n =71	1%	8%	8%	13%	10%	4%	6%	13%
Yes OA	n =13	23%	46%	15%	54%	38%	0%	8%	23%
Fisher's exact (with vs. without TMJ OA)		**0.011**	**0.002**	0.603	**0.002**	**0.018**	1	0.578	0.387

Figure 1. Results from this study are similar to those reported by Schultz (1956), which probably examined *M. mulatta*. This study also examined pathologies not reported by Schultz.

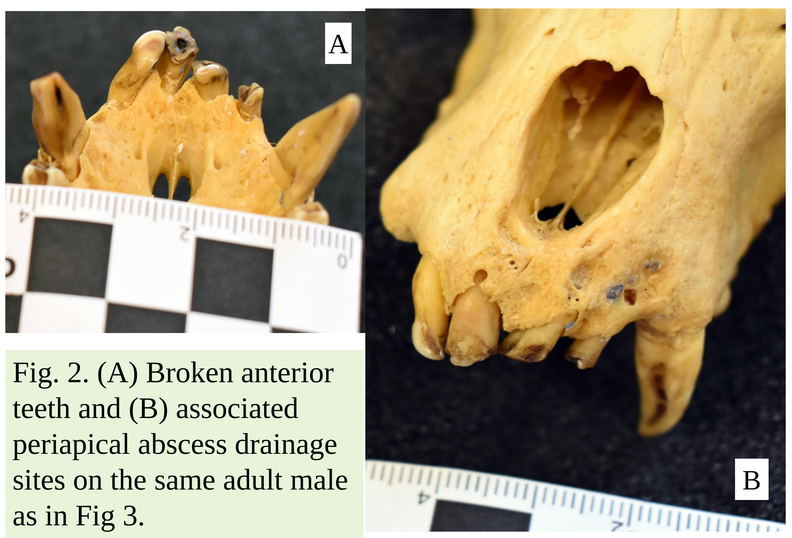

Fig. 2. (A) Broken anterior teeth and (B) associated periapical abscess drainage sites on the same adult male as in Fig 3.

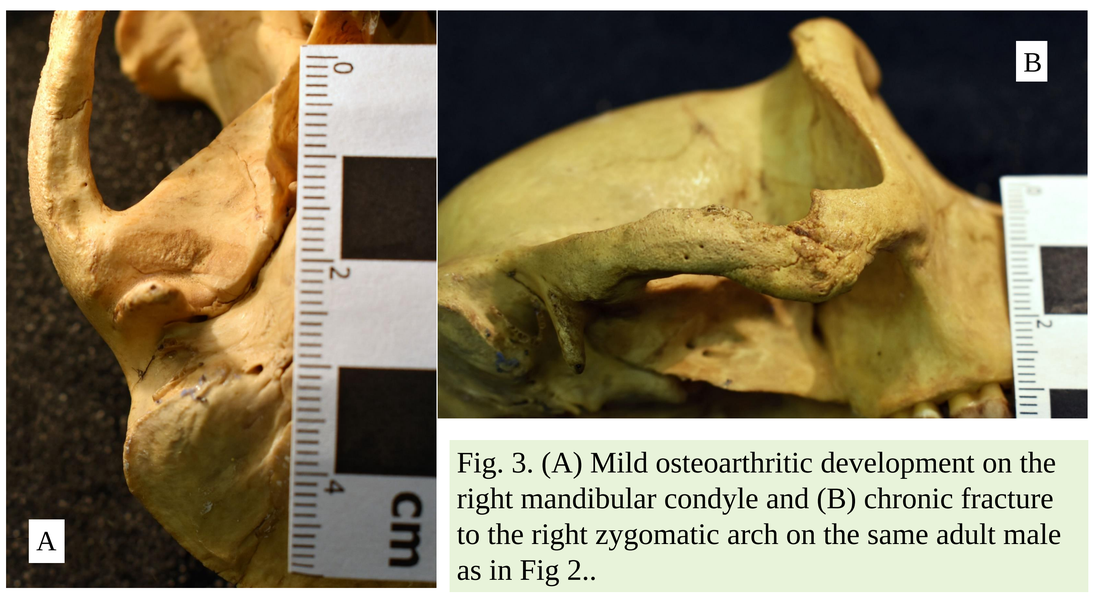

Fig. 3. (A) Mild osteoarthritic development on the right mandibular condyle and (B) chronic fracture to the right zygomatic arch on the same adult male as in Fig 2..

Discussion

Rates of caries, antemortem tooth loss (AMTL), and dental abscesses were similar in this study of *M. fascicularis* compared to previous work on macaques (Schultz 1956) (Figure 1). This study expands on previous work by using modern taxonomic assignments and examining additional types of lesions.

The hypothesis that female macaques would be more frequently affected by TMJ OA is not supported, but there were several differences in pathology rates for animals with versus without TMJ osteoarthritis (Table 1), which provides support for Hypothesis 2. Broken teeth and abscesses (Figure 2) likely measure related phenomena. While osteoarthritis is often a sequel to trauma (Figure 3), the rate of trauma in this sample may be too low to detect an association. Further analyses will examine lesions in more detail, including patterns related to the number of teeth affected in each individual and how dental position might be associated with TMJ OA. Future studies will also assess relationships between pathologies and overall craniofacial and dental morphology.

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