

Correlation between Lassa Virus and Odontogenic Tumors in Equatorial Africa

Marco de Feo^{1,2} Antonio Facchiano¹ Giuseppe Piccini³ Lapa Daniele⁴ Marco Lastilla⁵

^{1,2} Laboratory of Molecular Oncology, IDI-IRCCS, Rome, Italy and ² Volunteer at Saint Mary's Hospital Lacor, Gulu Northern Uganda

³ Head of the Microbiology and Virology Unit, IDI-IRCCS, Rome, Italy

⁴ Laboratory of Virology, National Institute for Infectious Diseases "Lazzaro Spallanzani" - Rome, Italy

⁵ Italian Air Force

Presenting author e-mail: m.defeo@idi.it

Background:

A high incidence of fibro-osseous odontogenic tumors, such as ameloblastoma, ossifying fibroma, fibromyxoma, and fibrous dysplasia, has been observed in pediatric and young adult patients in Uganda and the Democratic Republic of Congo (DRC). These tumors, rare in developed countries, have an unknown etiology. Our hypothesis suggests a correlation with Lassa virus (LASV), a zoonotic Arenavirus transmitted by rodents and bats.

Key observations:

- Tumor samples collected in rural DRC tested positive for LASV.
- High exposure to LASV may be linked to local dietary habits (consumption of rats and bats) and poor sanitation.
- Current management is exclusively surgical, often mutilating, with a high recurrence rate, possibly due to viral reactivation and malignant transformation.
- Our preliminary findings indicate a high LASV viral load in tumor and adjacent tissues, supporting its potential role as an oncovirus.
- In addition, LASV can serve as an agent of bioterrorism, leading to a local outbreak in non-endemic areas

Aim:

To detect arenaviruses in tumor and healthy tissues of Congolese patients exposed to potential LASV sources (wild animal consumption, contaminated water).

Methods

1. Study Design

- Type: Observational study
- Location: University of Kinshasa, Virology Department, National Institute of Biomedical Research (INRB), DRC
- Duration: 4 years
- Participants: 9 patients (55.5% under 18 years old) with odontogenic fibro-osseous tumors from rural villages
- Samples Collected: 32 tissue samples (tumor, oral mucosa, adjacent bone, distant healthy tissues)

2. Sample Collection & Analysis

- Histology: Hematoxylin-eosin (H&E) staining for diagnosis and characterization
- Radiology: X-rays and 3D CT scans for diagnostic support

3. Molecular Analysis for LASV Detection

- Sample Preservation: RNAlater (Thermo Fisher Scientific) to prevent RNA degradation
- RNA Extraction: QIAamp Viral RNA Mini Kit (Qiagen, Germany)
- Detection: RT-qPCR using RealStar Lassa Virus RT-PCR Kit 2.0 (Altona Diagnostics, Germany)
- Positivity Criteria: Cycle threshold (Ct) < 35 (all analyses performed in triplicate)

Main Results

- Total Samples Analyzed: 27 (5 samples excluded due to failed amplification)
- Presence of LASV: 81.5% of tissues tested positive. All patients tested positive for LASV.

Key Findings:

- Some LASV-negative tumors had surrounding tissues that tested positive
- Adjacent bone and oral mucosa tested positive in some cases

Conclusions

These findings suggest a possible correlation between LASV and odontogenic tumors.

However, further research with a larger sample size and a control group is necessary to confirm the hypothesis.

Proposed next steps:

- Expanding sample size to validate LASV oncogenic role
- Investigating viral integration mechanisms
- Assessing potential antiviral or immunotherapeutic strategies

Acknowledgements

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Young patient with recurrent odontogenic fibromyxoma-Uganda.



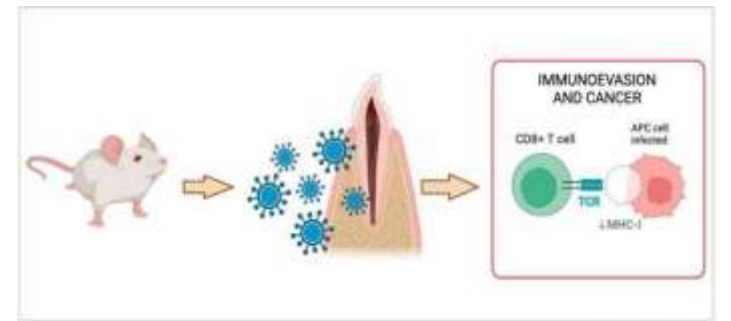
Patient with ossifying fibroma- Uganda.



Patient with ameloblastoma-Uganda



14 year old Congolese patient with recurrent ameloblastoma from whom biological samples were collected



Mechanism hypothesis. Rodents are the major reservoir of the Lassa virus (LASV). Rats are the main source of food, and we hypothesize that the virus may locally infect the tissues of the oral cavity in a similar mechanism as HPV in the oral mucosa and cervix. LASV enters cells via receptor-mediated endocytosis to transcribe its viral protein. LASV evades immunity through many mechanisms, including infecting antigen-presenting cells (APCs) or T lymphocytes directly.

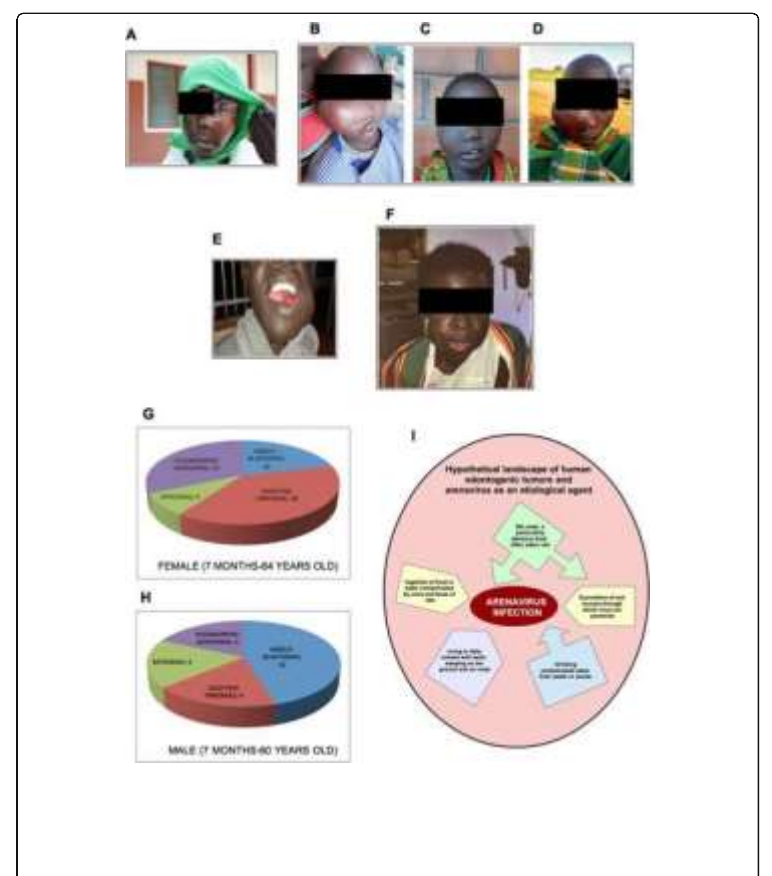


Fig. 1 a Example of odontogenic fibromyxoma in a young boy. b Six years old child from the ethnic group of Karimojong (Uganda) affected by ossifying fibroma. The photo shows second surgical procedure's results, due to a tumor recurrence. c The same six years old child presented in (b), after the third surgical procedure. d Again the same child, after six months from the third intervention. The tumor has recurred. e A woman affected by ameloblastoma before the third surgical procedure on the left side (First resection on 1998, the second on 2013, the third on September 2019). f The same patient captured only one month later the third surgical intervention, with a new tumor in the right side. Odontogenic tumors at Saint Mary's hospital in 2018. g Number of odontogenic tumors in female patients. h Number of odontogenic tumors in male patients. i Scheme of arenavirus infection ways that may cause latent and persistent infection in the human's oral cavity, causing odontogenic tumors.