



IS THE PRESENCE OF THE FOURTH MOLAR AN ATAVISTIC LOAD OF THE PRE-INCA AND INCA CULTURE?

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INTRODUCTION

- The presence of fourth molars in ancestral populations and their atavistic load on present-day individuals have not been broadly studied [1-2]. To the best of our knowledge, archeological investigations of Peruvian cultures on the presence of fourth molars have not been carried out.
- Several studies analyzing the incidence of fourth molars in modern populations show a wide range of results that go from 0.1% of the population to 3.8% with a higher incidence in male individuals[3]. Few studies analyze the incidence by race or ethnic background.
- There are several theories about the etiology of the fourth molar. All these theories include the genetic factor as a possible origin of the presence of the fourth molar [4-6]. This factor might be related to the atavistic or ancestral genetic load of the individual. For this reason, studying the ancestors of individuals who present a fourth molar will provide a hint into the atavistic load of ancient cultures.
- In this work, we present a clinical case of a fourth molar, of a patient from the Cusco region in Peru, who self-identified as having ancestors from the same region. Cusco was the capital of the Inca empire and was a large city that congregated population descendants of pre-Inca cultures.
- We explain the surgical planning for the extraction of the fourth molar, applying computerized axial tomography and 3D digital printing. Additionally, to understand the atavistic load of this individual, we analyze the archaeological remains of skulls of the pre-Inca and Inca culture, located in the Inca Museum of the "Universidad Nacional de San Antonio Abad del Cusco (UNSAAC)". We use periapical radiographs and digital photographs to search for indications of the presence of fourth molars. We finally discuss the findings found in the skulls of the pre-Inca and Inca cultures and the possible existence of an atavistic load for the presence of a fourth molar.

CASE REPORT

The patient is a 16-year-old male that visited the dental office, accompanied by his mother, for a dental check-up and evaluation to receive orthodontic treatment. Upon evaluation, patient is in good general health and after informed consent, the patient was evaluated, tested and treated.

Clinical examination: Permanent dentition with absence of the third molars.

Radiological examination:

•**Panoramic X-ray** (Fig 1) shows the presence of the third molar 4.8 in a vertical position, at the level of the mandibular tuberosity, in addition there is the presence of a distomolar or fourth molar located in the ascending ramus of the mandible in a horizontal position.

•**Computed Axial Tomography (CT Scan)** (Fig 2) shows the partially erupted fourth molar in a horizontal position at the level of the right retromolar triangle, crown oriented towards the lingual bone table, piece 4.8 submerged caudally, apices located near the right mandibular basal, lower dental canal in lingual relation to both and close to the mesial root of piece 4.8.



Figure 1 : Panoramic X-ray radiography

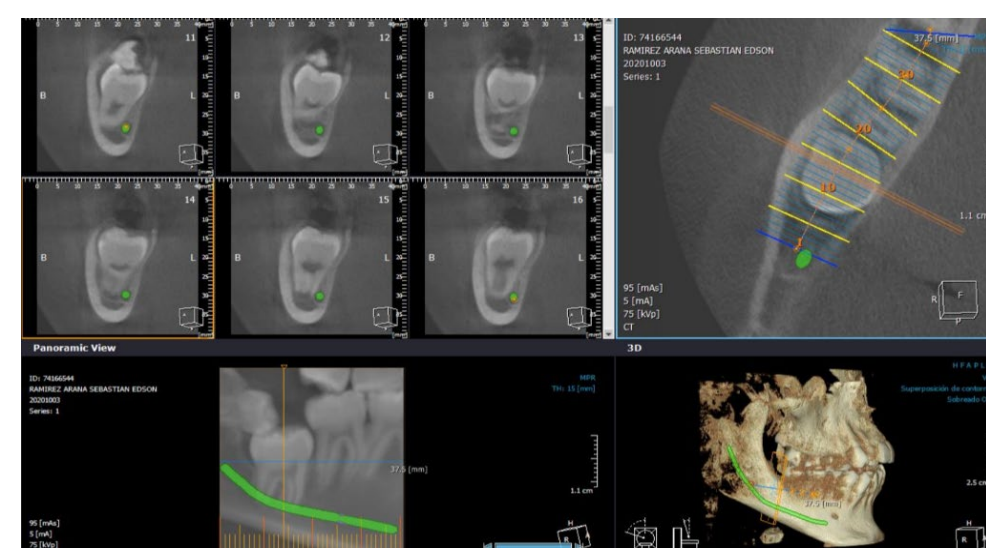


Figure 2 : CT Scan with axial slices

Diagnosis: Fourth molar in horizontal position in proximity to lower right third molar

Treatment: Dental extraction of the third and fourth molars to continue with orthodontic treatment

Surgical planning: Using complementary tests such as CT Scan, we collected data and converted it into a computer format that supports spatial axis that will allow three-dimensional representation and visualization of the disposition and density of the anatomical structures. We applied stereolithography 3D printing, a technology used to print high-resolution 3D prototypes to obtain a model with real size, solid and with a reliability of 99% [7,8] of the inner right lower hemimaxillary face to achieve a planning of the surgical approach (Fig 3-4).

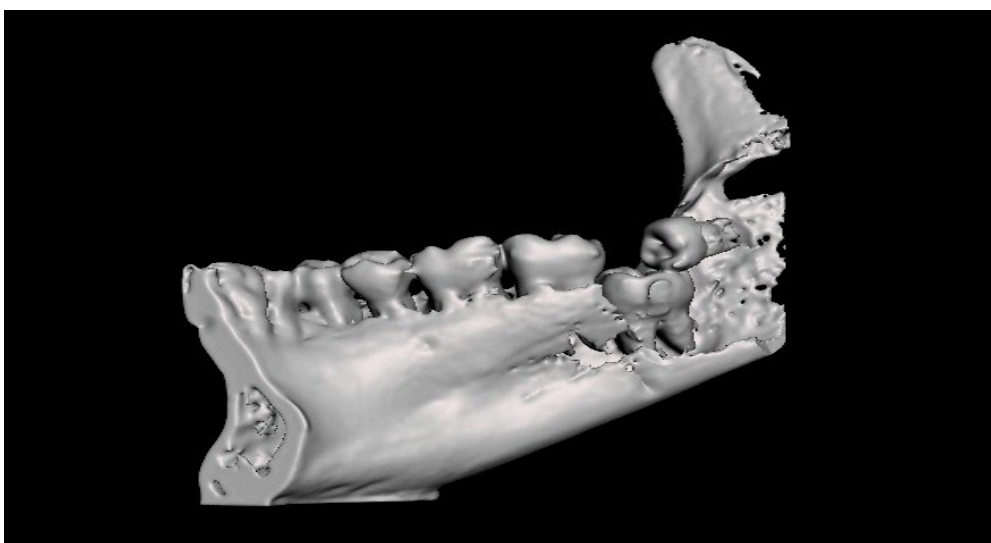


Figura 3: STL format on 3D software



Figura 4 : 3D printing

Surgical approach: It began with the anesthetic blockade of the inferior dental nerve; Long buccal and also anesthetize the mucosal area of the ascending ramus of the mandible. It continued with sulcular incision and suprcrestal incision up to 5mm above the retromolar angle area, elevation of the mucoperiosteal flap using a blunt periodontal curette, evidenced the bone and dental part. It followed with osteotomy of the fourth molar looking for initial detachment of the bone anchorage and continuing with a straight thin elevator for dislocation and removal of the dental piece with Adson forceps. Piece 4.8 is later withdrawn. Finally, remodeling of the bone edges was performed with rongeur forceps, cleaning of the alveolar cavities with a Lucas curette and washing with physiological solution to face the mucosal edges with a simple continuous suture in the entire area of the incision (Fig 5-8).

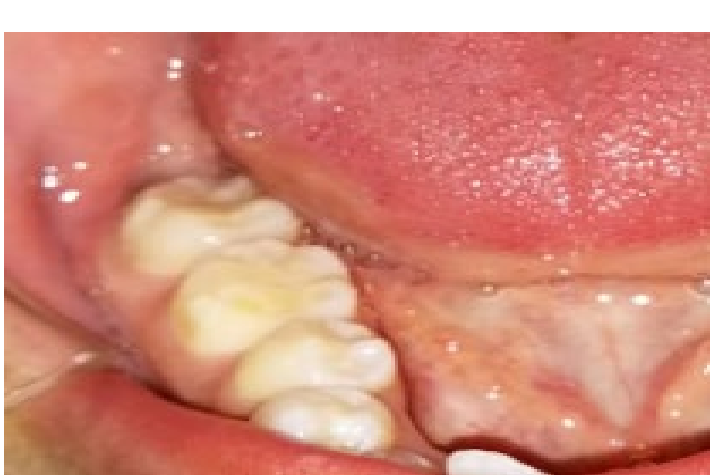


Figure 5: Retromolar area of the patient



Figure 6: Anesthetic block



Figure 7: Fourth molar extraction



Figure 8: Post extraction suture

FINDINGS OF ARCHAEOLOGICAL REMAINS OF THE PRE-INCA AND INCA CULTURE

The observational technique was carried out through the anthropological macroscopic review of the human bone remains belonging to individuals from the Inca and pre-Inca time located in the Inca Museum of the city of Cusco, prior authorization for the manipulation of the osteoarchaeological material to the Director of the museum. The total population was 256 skulls that are codified and stored in the anthropology cabinet of the museum. The sample size was 50 skulls, according to the formula for finite populations[9], of which 25 correspond to the Inca culture and 25 to the Pre-Inca culture.

A photographic and radiographic examination of the 50 skulls was carried out and a data collection sheet was prepared for the registration of the information. The visual inspection of the skulls was done following the protocol proposed by Chimenos et. al. [11]

Photographic Examination: Photographs were taken at different angles of each of the skulls with all the relevant characters, using a professional photographic camera. (Fig 9-10)

Radiological examination: Periapical radiographs of the posterior area of the lower and upper jaws of the skulls were taken, using a portable radiographic equipment. (Fig 11-12).

Characteristics	Skulls in the Inca Museum		Sample of Skulls		Fourth molars	
	n	%	n	%	n	%
Pre-inca culture	116	45.3	25	50	0	-
Inca culture	140	54.7	25	50	0	-
Total	256	100	50	100	0	-



Figure 9: Side photo of skull code MOH428



Figure 10: Side photo of the lower jaw code MOH42



Figure 11 : periapical X-ray of posterior area



Figure 12: periapical X-ray of mandibular molar

DISCUSSION

Studies on the possible atavistic load with the influence of the Inca and pre-Inca culture for the presentation of fourth molars and their etiology are not yet conclusive, however all the presentations of the fourth molar include the genetic factor as a possible origin. The fourth molar case report was presented in an adolescent patient from the city of Cusco, with ancestors from the same region.

In the Inca museum of the city of Cusco, 256 skulls from the Inca and pre-Inca culture were found, where a total of 50 skulls were reviewed, no findings of fourth molars were reported, these results could be due to the limited sample to which access was obtained. However, more conclusive studies are required to find a relationships between atavistic load and the presence of fourth molars.

The use of emerging technologies for surgical planning such as CT Scan and 3D printing offers us a new alternative with better efficiency for the diagnosis and treatment of patients. Thus, improves dental procedures and minimizes possible errors [10], by reducing procedure time, improving the precision of the surgical approach and is evidenced in the success of the treatment for the benefit of the patient. Also, due to its versatility, it is applied to various areas of dentistry such as orthodontics, maxillofacial surgery, implants, among others.

CONCLUSIONS

- The presence of fourth molars in ancestral populations and their possible atavistic load of the Inca and Pre-Inca cultures, requires more conclusive evidence in order to find an adequate theory for the benefit of science and culture.
- The contribution provided by the use of emerging technologies such as CT Scan and 3D dental printing for surgical planning in the area of oral surgery is very important and constitutes a great scientific and technological contribution to advances in the area of digital dentistry. It should be included in the complementary exams in surgical planning for dental students for the benefit of their academic training.

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