

## Enlargement of the genial tubercles: a case report

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### Abstract:

The genial tubercles are small bony protuberances located in the cortical lingual of the mandible, in the midline. The enlargement of the genial tubercles is more common in edentulous mandibles exhibiting bone resorption, is generally asymptomatic and diagnosed by routine imaging methods. This study describes a case of enlargement of the genial tubercles detected by cone-beam computed tomography prior to the placement of dental implants. Cone-beam computed tomography showed an unusual increase in size and volume on the inner surface of the mandible, in the midline, which had a pedunculated aspect and was similar in density to cortical bone, suggested enlargement of the genial tubercles. In conclusion, this bone prominence should be observed during the planning of rehabilitation treatment since its presence can influence the adaptation of dentures. Additionally, patients should be monitored regarding painful symptoms and the presence of fractures, with surgical removal being required in some cases.

**Keywords:** Cone-Beam Computed Tomography; Mandible; Diagnosis

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## INTRODUCTION

The genial tubercles are small bony protuberances located in the cortical lingual of the mandible, slightly above the mandibular base, in the midline<sup>1,2,3</sup>. These structures are divided into two parts: the superior genial tubercles, which are the sites of origin of the genioglossus muscle, and the inferior genial tubercles, which are the sites of origin of the geniohyoid muscle<sup>3</sup>. Generally, the superior genial tubercles are located bilaterally, with a mean height of 5.82 mm and a mean width of 6.98 mm. On the other hand, the inferior genial tubercles are usually indistinguishable<sup>4</sup>.

Radiographically, the genial tubercles appear as a circular radiopacity located beneath the apices of the lower incisors, which can be observed on conventional periapical, occlusal and panoramic radiographs<sup>1</sup>, as well as by three-dimensional imaging methods such as cone-beam computed tomography (CBCT). Advances in imaging systems have permitted a detailed and reliable three-dimensional view of the structures present in the maxilla and mandible, favoring the identification of anatomical variations that can have implications for surgical planning. Additionally, CBCT produces thin-section images that favor the visualization of bone structures<sup>4</sup>.

The first case of enlargement of the genial tubercles was reported in 1955, with the tubercles measuring 13 mm in their outer diameter<sup>5</sup>. This alteration is more common in edentulous mandibles exhibiting bone resorption and is generally asymptomatic and diagnosed by routine imaging methods. Surgical removal is not required<sup>6</sup>. However, surgical treatment is necessary in some cases for denture placement and for preventing possible complications such as fractures<sup>2</sup>.

In view of the importance of identifying anatomical variations in preoperative imaging tests because these structures can directly influence therapeutic success, this study describes a case of enlargement of the genial tubercles detected by CBCT prior to the placement of dental implants.

## CASE REPORT

Patient MSS, a 42-year-old woman, was referred to the radiology service for CBCT of the mandible (Kodak 9000 3D, Kodak Dental Systems, Carestream Health, Rochester, NY, USA) for the planning of rehabilitation treatment with dental implants. Intra- and extraoral examination did not reveal significant findings and the patient was asymptomatic.

Five teeth were missing in the mandible of the patient, including three incisors, the region where evaluation for dental implant planning was requested. CBCT showed an unusual increase in size and volume on the inner surface of the mandible, in the midline, which had a pedunculated aspect and was similar in density to cortical bone (Figure 1a).

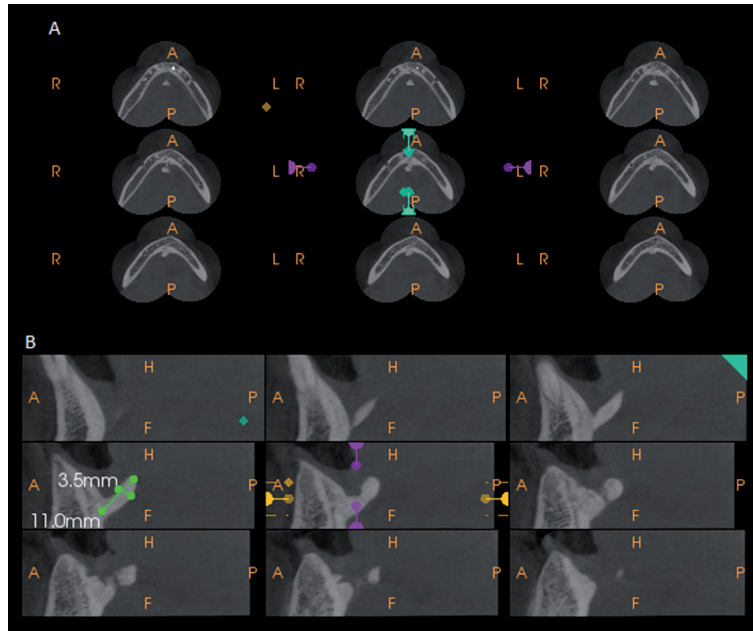
The imaging feature and anatomical location suggested enlargement of the genial tubercles. These structures were measured from the lingual surface of the mandible to the apex of the bone structures, revealing a length of 11 mm and a height of about 3.5 mm (Figure 1b). The three-dimensional reconstruction shown in Figure 2a, b and c illustrates the findings.

## DISCUSSION

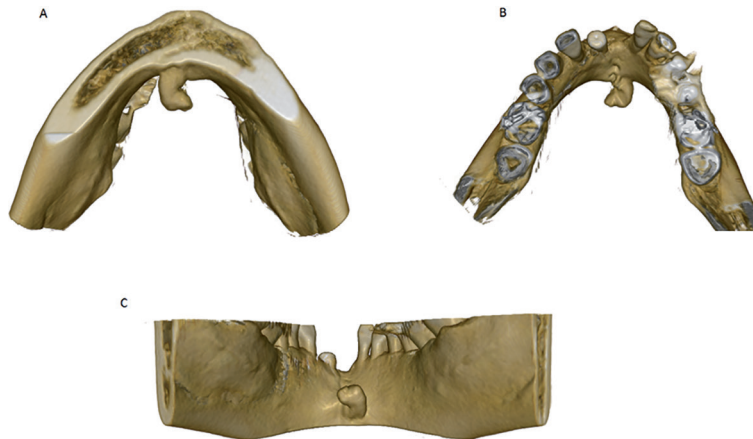
Among the anatomical structures found in the mandible, the genial tubercles serve as a site of muscle insertion and are located on the medial surface of the body of the mandible, in the midline<sup>1,2</sup>. Current knowledge of dental implants has increased the possibilities of rehabilitation treatment for patients with edentulous mandibles, which had been restricted to the placement of complete dentures. In this respect, the edentulous mandible can serve as a bone anchor for implants due to its morphological characteristics that permit the placement of dental implants in the remnant alveolar ridge<sup>7</sup>.

Anatomical variations, as well as dimensional and morphological alterations, in the edentulous mandibular bone affect the planning and often the quality of surgical-restorative interventions. In the mandible, alveolar bone resorption can significantly alter bone height, causing anatomical alterations such as enlargement of the genial tubercles<sup>2,8</sup>. According to MacLeod and MacIntyre (1992)<sup>9</sup>, the use of poorly adapted complete dentures can cause chronic irritation in the area, triggering dystrophic calcification of the tendinous insertion of the genioglossus muscle, a condition commonly known as hypertrophy of the genial tubercles. The genial tubercles are small under normal conditions, but prosthetic rehabilitation is impaired in cases of enlargement from the lingual cortical of the mandible, with the occurrence of fractures and painful symptoms<sup>2</sup>.

Generally, enlargement of the genial tubercles is an asymptomatic condition, which is diagnosed by routine imaging tests. Surgical removal is not required<sup>6</sup>. However, Rubira-Bullen et al. (2010)<sup>2</sup> recently described the case of a patient with enlargement of the genial tubercles, which



**Figure 1.** Enlargement of the inner surface of the mandible. (A) Axial sections and (B) parasagittal sections.



**Figure 2.** Three-dimensional reconstruction of the mandible in the inferior axial (A), superior axial (B), and lingual (C) view.

measured 18 mm in length and caused swelling of the floor of the mouth and pain sensation. Resection of the bone fragment was necessary in this case to avoid possible complications such as fractures<sup>2</sup>. Jindal et al. (2015)<sup>10</sup> reported another case of a patient with enlargement of the genial tubercles, which measured 21 mm in length, causing pain and ulceration. Resection of the enlargement of the genial tubercles was needed to better the symptoms. Furthermore, in edentulous patients, enlargement of the genial tubercles may only be identified after fracture of these bone structures, which frequently causes symptoms such as pain, submental hematoma, dysphagia, and difficulties in tongue movement<sup>8</sup>.

In the present case, CBCT for dental implant planning detected enlargement of the cortical lingual of the mandible, in the midline. Based on the imaging features and anatomical location, the diagnosis was enlargement of the genial tubercles. A search of the PubMed database using the term “genial tubercles” revealed seven cases of enlargement of the genial tubercles. However, this case is special because the variation was identified in a 42-year-old woman who only had a partially edentulous mandible, while in the previous reports (Table 1) this condition mainly occurred in edentulous older adults.

**Table 1.** Main characteristics of the cases of enlargement of the genial tubercles published between 1957 and 2015.

Author	Gender	Age (years)	Symptoms	Length	Detection
Monheimer <sup>5</sup>	M	-	-	13 mm	-
Wiesenbaugh and Bingham <sup>6</sup>	M	47	None	-	Occlusal radiography
Santos-Oller et al. <sup>8</sup>	F	68	Painful enlargement. Edentulous.	-	Occlusal radiography
Macleod and Macintyre <sup>9</sup>	F	56	Painful enlargement. Edentulous. Use of a complete denture	-	Profile teleradiography
Greyling, Le Grange and Meiring <sup>3</sup>	F	70	Edentulous and alveolar bone resorption.	10 mm	Dissection – cadaver.
Selvamuthukumar, Aswath and Karthika <sup>11</sup>	M	70	Enlargement.	18 mm	Occlusal radiography
Rubira-Bullen et al. <sup>2</sup>	F	70	Painful enlargement. Edentulous. Use of a complete denture.	18 mm	Conventional radiography and CBCT
Jindal et al. <sup>10</sup>	M	78	Discomfort while eating	21mm	CBCT
Present case	F	42	Asymptomatic	11 mm	CBCT

M: male; F: female; CBCT: cone-beam computed tomography.

As can be seen in Table 1, enlargement of the genial tubercles is a rare condition, with the present patient corresponding only to the ninth case reported in the literature. Although some authors reported the presence of size variation in the genial tubercles, the present case has some peculiarities, such as the absence of complete edentulism and the age of the patient, which was the youngest case with enlargement of the genial tubercles.

Since the patient was asymptomatic, the case was only diagnosed with the aid of CBCT, a method widely used for the evaluation of bone thickness and height at sites of dental implant placement<sup>4</sup>. However, as shown in Table 1, most cases of genial tubercle prominence reported in the literature were detected by conventional (occlusal) radiography and teleradiography. This is due to the fact that the case reports were published at a time when CBCT was not accessible. At present, with better access to rehabilitation treatment with dental implants, CBCT has become important for the identification of noble anatomical structures and their variations, rendering the diagnosis and surgical planning more accurate. Particularly in the present case, CBCT contributed to the delimitation and characterization of the enlargement and permitted to rule out other diagnostic hypotheses such as peripheral osteoma.

In conclusion, this study describes a rare case of enlargement of the genial tubercles. This bone prominence should be observed during the planning of rehabilitation treatment since its presence can influence the adaptation of dentures. Additionally, patients

should be monitored regarding painful symptoms and the presence of fractures, with surgical removal being required in some cases.

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