



## การผ่าตัดกระดูกที่ยึดตัวออกจากกระดูกโหลกศีรษะยาวผิดปกติ จนกดเส้นประสาทไฮโปกลอสซัล ที่ควบคุมกล้ามเนื้อ และการทำงานของลิ้น : รายงานผู้ป่วย 1 ราย

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### Surgical Treatment of Elongated Styloid Process Causing Hypoglossal Nerve Compression, Leading to Tongue Atrophy and Limited Tongue Movement : A Case Report

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#### บทคัดย่อ

**หลักการและวัตถุประสงค์:** กระดูกสไตลอยด์ เป็นโครงสร้างที่มีลักษณะเป็นกระดูกยาวและบางคล้ายเข็ม โผล่ออกมาจากส่วนล่างของกระดูกขมับ กระดูกสไตลอยด์อาจยาวเกินปกติได้ อาจกดทับโครงสร้างโดยรอบและทำให้เกิดการกดทับเส้นประสาทไฮโปกลอสซัล ทำให้เกิดความผิดปกติในการพูด ความลำบากในการกลืน และลิ้นฝ่อ โดยการพิจารณาว่าจะผ่าตัดหรือไม่ขึ้นอยู่กับขนาดของรอยโรค บทความนี้เป็นรายงานความสำเร็จของการผ่าตัดกระดูกสไตลอยด์ที่ยาวเกินปกติ คือ 4-5 เซนติเมตร เพื่อบรรเทาการกดทับเส้นประสาทไฮโปกลอสซัล ทำให้อาการลิ้นกระดูกหายไปอย่างสมบูรณ์ ลิ้นไม่มีอาการชา และการทำงานค่อย ๆ ฟื้นตัวขึ้นเป็นปกติ

**วิธีการศึกษา:** ผู้ป่วยเพศชายอายุ 36 ปี มาด้วยอาการกั๊กลิ้นด้านขวาโดยบังเอิญขณะเคี้ยวอาหาร ซึ่งตามมาด้วยอาการกระดูกของลิ้นด้านขวา ภายหลังการตรวจด้วยภาพเอกซเรย์คอมพิวเตอร์ พบว่ากระดูกสไตลอยด์ขวามีความยาว 5.4 เซนติเมตร ซึ่งอาจเป็นสาเหตุที่ทำให้เกิดอาการดังกล่าว การศึกษาครั้งนี้มีจุดมุ่งหมายเพื่อประเมินลักษณะและอาการที่เกี่ยวข้องกับการทำงานของลิ้นก่อนและหลังการผ่าตัด โดยเน้นที่การวัดผลของอาการฝ่อของลิ้นในภาวะพักและขณะระดับเกรด 0-2 รวมถึงอาการกระดูกและขาของลิ้น

**ผลการศึกษา:** หลังการผ่าตัดเพื่อเอากระดูกสไตลอยด์ที่ยาวเกินไปออก อาการกระดูกและอาการชาของลิ้นหายไปโดยสมบูรณ์ภายใน 1 ชั่วโมง การทำงานของกล้ามเนื้อลิ้นเริ่มฟื้นตัวอย่างค่อยเป็นค่อยไปตั้งแต่วันที่ 5 และฟื้นตัวเต็มที่ภายใน 1 เดือนหลังการผ่าตัด

**สรุป:** รายงานผู้ป่วยที่เป็นโรคกระดูกสไตลอยด์ยาวผิดปกติ อาจทำให้เกิดการกดทับเส้นประสาทไฮโปกลอสซัล ที่ควบคุมกล้ามเนื้อและการทำงานของลิ้นได้ การผ่าตัดกระดูกสไตลอยด์ส่วนเกิน ช่วยให้การทำงานของลิ้นและสภาพลิ้นที่เคยฝ่อกลับมามีสุขภาพดี

**คำสำคัญ:** กระดูกสไตลอยด์ที่ยาวผิดปกติ, การกดทับเส้นประสาทไฮโปกลอสซัล, ภาวะลิ้นฝ่อ

## Abstract

**Background and Objective:** The styloid bone is a structure that appears as a long, thin, needle-like rod protruding from the lower part of the temporal bone. It may extend beyond its normal length, which can compress surrounding structures and lead to hypoglossal nerve compression. This may cause speech abnormalities, difficulty swallowing, and atrophy of the tongue. Surgical intervention or not depends on the size of the lesion. This article reports the success of surgery on an abnormally longer styloid bone measuring than 4-5 cm, relieving compression on the hypoglossal nerve, leading to complete cessation of tongue twitching without any numbness and normal of tongue muscle function gradually restoration.

**Method:** A 36-year-old male patient who presented with the complaint of accidentally biting the right side of his tongue while chewing food, followed by right-sided tongue twitching. After undergoing a CT scan, it was found that the right styloid bone measured 5.4 cm in length, which would be the cause of symptoms. The aim of this study was to assess the characteristics and symptoms related to the function of the tongue before and after surgery, focusing on the measurement of tongue atrophy in both resting and protruding positions, graded from 0 to 2, including tongue twitching and paresthesia.

**Results:** After surgery to remove the excessively long styloid bone, the tongue twitching and paresthesia were completely resolved within the first hour post-operation. Tongue muscle function began to recover gradually starting on the 5th day, and complete recovery by the 1st month after surgery.

**Conclusion:** This report presents a case report of a patient with abnormally long styloid bone, which led to compression of the hypoglossal nerve controlling the tongue muscles. Surgical removal of the excess styloid bone restored normal tongue function completely.

**Keywords:** styloid process elongation, hypoglossal nerve compression, tongue atrophy

## Introduction

The styloid process is a cylindrical, slender, needle-like projection. The styloid process projects from the inferior part of the petrous temporal bone and offers attachment to the stylohyoid ligament and the stylohyoid, stylopharyngeus, and styloglossus muscles.<sup>1</sup> It may elongate due to various factors, potentially leading to compression of surrounding anatomical structures and subsequent complications. This elongation can result in Eagle's syndrome, a condition characterized by symptoms such as dull, aching throat pain, difficulty swallowing, a sensation of a foreign body in the throat, facial pain, recurrent headaches, and vertigo.<sup>2</sup>

The styloid process typically measures between 0.20-0.30 cm in Caucasians and 1.54-1.88 cm in Asians. Variations in length may arise from genetic factors, developmental anomalies, or past trauma.<sup>3</sup> When the styloid process extends beyond the normal range, it may exert pressure on adjacent structures, including nerves and blood vessels, leading to neurological symptoms. One critical nerve affected by this elongation is the hypoglossal nerve, which controls tongue muscle movements essential for speech and swallowing. Compression of the hypoglossal nerve may lead to dysarthria (unclear speech), dysphagia (difficulty swallowing), and tongue muscle atrophy, which can impair both speech and food management.<sup>4</sup>

The biomechanical mechanism of compression involves the elongated styloid process exerting pressure on the hypoglossal nerve as it traverses nearby structures. This compression may result in nerve ischemia, leading to deficits in tongue mobility. Imaging studies such as computed tomography (CT)<sup>5</sup> and magnetic resonance imaging (MRI)<sup>6</sup> play a crucial role in diagnosing styloid process elongation and evaluating its relationship with hypoglossal nerve compression. Surgical intervention, particularly styloidectomy, remains the primary treatment to alleviate nerve compression by removing the elongated styloid process.<sup>7</sup>

This case report aims to examine existing research on styloid process elongation, its anatomical effects, and its potential role in compressing the hypoglossal nerve. Specifically, this report focuses on the relationship between elongated styloid process and symptoms such as tongue atrophy and limited tongue movement. By analyzing the biomechanical impact of the hypoglossal nerve compression and reviewing diagnostic and management strategies, this report seeks to contribute to a better understanding of this rare but significant condition.

The incidence of elongated styloid process among patients undergoing radiographic imaging ranges from 4% to 28.0%<sup>10-13</sup> indicating that is not uncommon in the general population: is not uncommon. The primary treatment for elongated.

The primary treatment for elongated styloid process associated with Eagle's syndrome is surgical resection of the styloid process (styloidectomy), which has shown favorable outcomes in the majority of patients, particularly when diagnosis is clear and early intervention is provided. Patients typically experience marked symptomatic relief following surgery, including improvement in neck pain, dysphagia, or hypoglossal nerve-related symptoms such as tongue atrophy or impaired movement due to nerve compression.

Recovery of nerve function, particularly of the hypoglossal nerve, has been reported to occur either gradually or in some cases rapidly, depending on the severity and duration of nerve compression. Surgical decompression may lead to full restoration of function, especially if performed early in the course of the disease. In contrast, conservative treatments, such as analgesics or local steroid injections, may provide temporary relief in patients with mild symptoms but do not resolve the underlying anatomical cause. Several studies have reported favorable outcomes after surgical treatment of Eagle's syndrome, particularly in cases involving cranial nerve compression.<sup>7</sup> Watanabe et al.<sup>15</sup> reported gradual improvement of hypoglossal nerve palsy following

decompression. Ahmed et al.<sup>17</sup> observed significant recovery of tongue function within weeks of surgical resection. Keur et al.<sup>18</sup> highlighted the clinical importance of recognizing elongated styloid process

in symptomatic patients. Piagkou et al.<sup>19</sup> reviewed multiple cases and supported surgical treatment as the definitive approach in symptomatic Eagle's syndrome.

**Table 1** Preoperative Clinical Features of Hypoglossal Nerve Compression Attributable to Right Styloid Process Elongation

Timepoint	Tongue Atrophy	Tongue Twitching	Paresthesia
Before Surgery	Grade 2 right-sided hemiatrophy in resting and protruding	Present	Present

**Table 2** Postoperative Clinical Outcomes Following Right Styloidectomy for Hypoglossal Nerve Compression Attributable to Styloid Process Elongation

Timepoint	Tongue Atrophy	Tongue Twitching	Paresthesia
1 <sup>st</sup> Hour After Surgery	Grade 2 right-sided hemiatrophy in resting and protruding	Absent	Absent
1 <sup>st</sup> to 4 <sup>th</sup> Day After Surgery	Grade 2 right-sided hemiatrophy in resting and protruding	Absent	Absent
5 <sup>th</sup> Day After Surgery	Grade 1 right-sided hemiatrophy in protruding position	Absent	Absent
1 Month After Surgery	Grade 0, no atrophy in resting and protruding	Absent	Absent

### Case reports

A case of a 36-year-old man who presented with complaints of accidentally biting the right side of his tongue while chewing, followed by twitching of the right side of tongue for the past month. The initial examination revealed atrophy of the right side of tongue, with no other specific lesions observed, as Figure 1.



**Figure 1** A 36-year-old man who presented with accidentally biting the right side of his tongue while chewing, followed by twitching of the right side of the tongue.

The grading system for tongue atrophy was based on its appearance in both resting and protruding positions, ranging from G0 to G3:

G0: No hemiatrophy observed in either the resting or protruding position, G1: No deviation of the tongue tip in the resting position, but deviation to the side in the protruding position., G2: Hemiatrophy observed in both the resting and protruding positions, though the patient can still protrude the tongue beyond the incisors.G3: The patient is unable to protrude the tongue beyond the incisors due to severe hemiatrophy.<sup>8</sup>

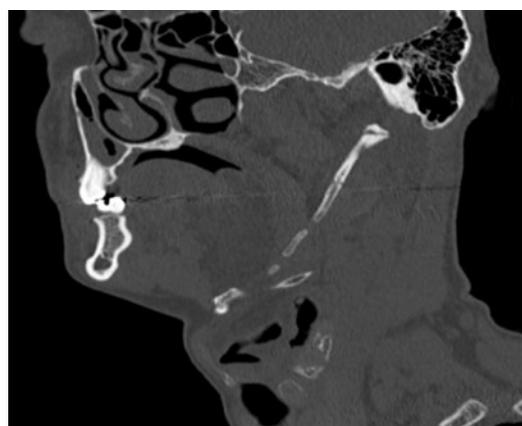
For twitching and paresthesia, the symptoms will be assessed based on whether or not they are present during the examination.The tongue right hemiatrophy in the resting and protruding position was graded 2 as Table 1.This study was to evaluate the characteristics and symptoms related to the function of the patient’s tongue before and after surgery, with a focus on assessing tongue atrophy

CT measurements show length of right styloid process approximately 5.4 cm, exerting pressure on the right carotid space and associated with intrinsic atrophy of the right side of the tongue: Chronic denervation of right hypoglossal nerve. So cranial nerve compression should be consider. The findings indicate an elongation of the right styloid process. as seen in the figures 2, 3.

MRI of the brain and skull base, along with MRA of the brain and carotids with contrast, revealed the following findings: relatively small size and no definite enhancement of the right hypoglossal nerve, with denervation of the right tongue muscle (atrophy and fatty infiltration).



**Figure 2** Computed tomography with three-dimensional reconstruction image revealing the length of the styloid process as 5.4 cm on the right and 2.6 cm on the left.



**Figure 3** Sagittal CT view shows elongated styloid process at right side.

The patient underwent transcervical styloidectomy. The procedure was performed under general anesthesia. Intraoperative finding: a 4-5 cm right styloid process was found compressing the hypoglossal nerve, as shown in Figures 4. The right styloid process was resected by 3 cm via a transcervical approach, preserving the facial nerve and lingual nerve as figure 5.



**Figure 4** Intraoperatively, a 4-5 cm right styloid process was found compressing the hypoglossal nerve.



**Figure 5** The right styloid process was resected by 3 cm.

### Results

After the surgery, the recovery of the hypoglossal nerve was assessed by observing the progression of nerve recovery over time.<sup>9</sup> This could be evaluated by grading tongue atrophy and tongue movement as Table 2. Postoperatively, the patient reported complete resolution of tongue twitching and paresthesia within the first hour. There was a gradual recovery of tongue muscle function starting from the 5<sup>th</sup> day, with hemiatrophy only observed in the protruding position. No atrophy was presented in the resting position..Follow-up examinations 1<sup>st</sup> month after surgery confirmed tongue atrophy both resting and protruding, Normal tongue movement, no paresthesia. This case was not required for anti-inflammatory drugs.

### Discussion

Eagle’s syndrome, caused by the elongation of the styloid process or calcification of the stylohyoid ligament, is a well-documented condition in otolaryngology. This condition leads to mechanical compression of adjacent structures, including cranial nerves such as the hypoglossal nerve. This compression can result in various symptoms, including dysphagia, facial pain, and neurological deficits such as tongue atrophy, twitching, and paresthesia, as observed in the current case. The imaging findings, such as the elongated styloid process and the denervation of the tongue muscles, confirmed that chronic compression of the hypoglossal nerve was responsible for the observed symptoms.<sup>5</sup>

In this case, the decision to proceed with transcervical styloidectomy was aimed at relieving pressure on the hypoglossal nerve. Postoperatively, the patient showed rapid improvement. Within the first hour following surgery, the patient experienced complete resolution of tongue twitching and paresthesia. By the fifth day, there was a gradual recovery of tongue muscle function, with full recovery of both tongue function and resolution of atrophy by the first month after surgery. This rapid recovery indicates that decompression of the hypoglossal nerve allowed for the restoration of nerve function, and supports the hypothesis that early intervention can lead to the reversal of denervation changes in the tongue muscles. The positive postoperative outcome underscores the regenerative capacity of the hypoglossal nerve after surgical decompression.

Transcervical styloidectomy, as demonstrated in this case, is an effective minimally invasive procedure. It allows for direct visualization of the affected area while preserving vital structures, such as the facial and lingual nerves. The preservation of these structures prevents further neurological deficits and ensures a better outcome. The successful resolution of symptoms in this patient supports the procedure as a standard treatment for Eagle syndrome, particularly when it involves the hypoglossal nerve.

The findings in this case are consistent with previously reported cases in the literature, where an elongated styloid process led to hypoglossal nerve compression and resultant tongue atrophy with limited movement. Watanabe et al. reported a similar case of unilateral tongue atrophy due to hypoglossal nerve compression, which showed gradual but incomplete recovery following decompression surgery.<sup>15</sup> In contrast, Ahmed et al. described a patient with isolated hypoglossal nerve palsy caused by an elongated styloid process, who underwent surgical resection and demonstrated significant improvement in tongue mobility and atrophy within several weeks.<sup>14</sup> Additionally, Altun and Camci reported a case of bilateral hypoglossal nerve paralysis following elongated styloid process resection, highlighting the potential for postoperative complications.<sup>16</sup> Compared to these reports, the present case showed an even more rapid recovery, with complete resolution of twitching and paresthesia within hours and full restoration of tongue function within one month. This suggests that early diagnosis and prompt surgical decompression may contribute to a better prognosis. The positive outcomes across these cases support the efficacy of styloidectomy as a definitive treatment for Eagle's syndrome with hypoglossal nerve involvement.<sup>14-16</sup>

### Conclusion

This case underscores the importance of early diagnosis and timely surgical intervention in patients with cranial nerve compression due to Eagle syndrome. The patient's positive outcome demonstrates that styloidectomy is an effective treatment for cranial nerve compression caused by an elongated styloid process. It emphasizes the need for otolaryngologists to consider Eagle syndrome as a potential cause of unexplained tongue symptoms, as early recognition and intervention can significantly improve patient outcomes. Elongation of the styloid process can lead to hypoglossal nerve compression, resulting in tongue atrophy, twitching, and

dysfunction. A multidisciplinary approach, with early radiological investigation—particularly CT scans of the styloid process—is advisable in such cases. Surgical resection via transcervical styloidectomy proves to be an effective treatment, leading to symptom resolution and functional recovery. Early diagnosis and intervention remain crucial for achieving optimal patient outcomes. Further research should focus on long-term follow-up of patients undergoing transcervical styloidectomy to refine treatment protocols and enhance patient care.<sup>7</sup>

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