

**Research Article**

## Anatomical Variations in the Length of Styloid Process

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### ABSTRACT

The styloid process is a bony projection. It projects down and forward from the inferior surface of the temporal bone and functions as an anchor point for several muscles associated with the tongue and larynx. It is 4.6 mm in males and 4.7 mm in females on an average. In some cases it is elongated and causes various clinical symptoms such as cervicofacial and neck pain regarded as eagle's syndrome. Myocardial infarction, tinnitus, dysphagia, sore throat, otalgia etc are caused by the compression of carotid nerve plexus. It also compresses many nerves passing near that area like vagal nerve, inter jugular vein, glossopharyngeal nerve, facial nerve, hypoglossal nerves which may lead to further complications and leads to death.

**Keywords:** Styloid process, Elongated styloid process, Stylohyoid ligament, Anatomic variation, Eagles syndrome.

### INTRODUCTION

**S**tyloid process of the temporal bone is a slender, thin and sharp projection measuring 2 to 3 centimeters in length which lies anteromedially to the mastoid process which protrudes downwards and forwards from the underside of the temporal bone. The styloid process is usually straight but it is occasionally curved. There are very few research reports on the shapes of the styloid process. The length of the styloid process ranging from few millimeters to centimeters<sup>1</sup>. The styloid process situated between the internal carotid artery and external carotid artery, posterior to the pharynx, that covers stylohyoid, styloglossus and stylopharyngeal muscles<sup>2</sup>. The process is covered by the parotid gland laterally<sup>3</sup>.

The styloid process gives attachments to two ligaments and muscles they are stylohyoid and stylomandibular ligaments and stylopharyngeus, stylohyoid and styloglossus<sup>1</sup>. The embryonic origin of styloid process lies in the "Reichert's cartilage" of the second pharyngeal arch, together with the stylohyoid ligament and the lesser horn of hyoid bone forms an apparatus called stylohyoid apparatus or stylohyoid complex<sup>4</sup>. The normal length of the styloid process is in between 2 and 3 millimeters<sup>5</sup>, and can vary from person to person and even between the same side of the same individual. When the processes exceed this average it is assigned the term elongation<sup>6</sup>.

The elongation of the styloid process is considered as an anomaly which can be accompanied by calcification of the stylohyoid ligament and the stylomandibular ligament. The clinical features of the elongated styloid process were first described by Watt W. Eagle in the year 1937<sup>7</sup>.

Later to that he described the two distinct syndromes associated with anomalous growth of the styloid process: the styloid process syndrome and the carotid artery

syndrome. This elongation of the styloid process can trigger a series of symptoms such as dysphagia, odynophagia, facial pain, ear pain, head ache, tinnitus and trismus. This set of symptoms along with the elongated styloid process is called "Eagle's syndrome"<sup>8</sup>. The elongation of the styloid process was first discovered by Italian surgeon Pietro Marchetti in the year 1652<sup>7</sup>. The syndrome is attributed with several other symptoms, such as foreign body sensation in the throat, pain on rotation of the head, neck pain and pain when swallowing<sup>9,10</sup>.

However none of these symptoms are pathognomonic for the Eagle's syndrome<sup>8</sup>. The styloid process is normally composed of dense connective tissue in adults but may retain its embryonic cartilage and the potential for ossification<sup>11</sup>.

### Temporal Styloid Process

Just below the ear, the styloid process is a slender pointed piece of bone which projects down and forward from the inferior surface of the temporal bone. It functions as an anchor point for several muscles associated with the tongue and larynx.

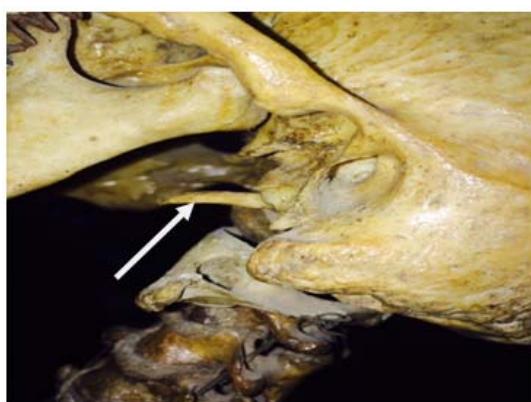
- The *proximal part (tympanohyal)* is ensheathed by the vaginal process of the tympanic portion.
- While the *distal part (stylohyal)* gives attachment to the following ligaments and muscles.
- Stylohyoid ligament
- Stylomandibular ligament
- styloglossus muscle muscle (innervated by the hypoglossal nerve)
- stylohyoid muscle (supplied/innervated by the facial nerve)



- stylopharyngeus muscle (innervated by the glossopharyngeal nerve)

The stylohyoid ligament originates from the apex of styloid process and inserts into the lesser cornu of the hyoid bone. In some instances the ligament is partially ossified while in others it is completely ossified.

A small percentage of the population will suffer from an elongation of the styloid process and calcification of the stylohyoid ligament. This condition is referred to Eagle's syndrome. Normally the tissues present in the throat rub on the styloid process during the act of swallowing, resulting pain along the glossopharyngeal nerve. This syndrome is commonly accompanied by pain upon turning the head or extending the tongue forward or in any direction. The other symptoms may include occipital neuralgia, pain in teeth and jaw, voice alteration, cough, dizziness, migraines etc.



**Figure 1:** Styloid process in dry skull

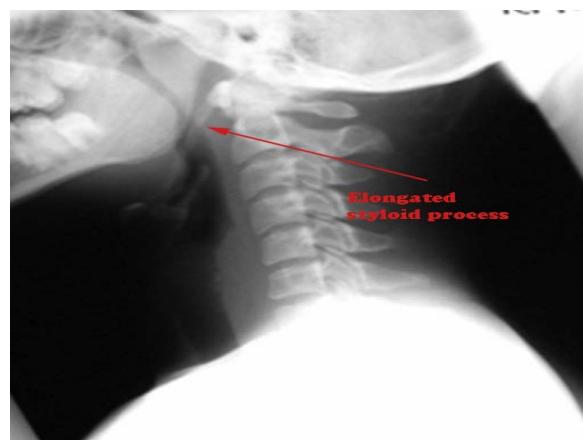


**Figure 2:** Styloid process in radiograph

#### Treatment and Diagnosis of Elongated Styloid Process

Eagle's syndrome is diagnosed by both physical examination and on radio graphical examinations. The palpation of the styloid process in the tonsillar fossa is indicative of SPE which are not palpable normally. The palpation of the tip of the Styloid process should exacerbate existing symptoms. Which are highly suspicious for Eagle's syndrome, the confirmations for this can be done by radiographical imaging<sup>12</sup>. More commonly; a panoramic radiography (PR) is used to

determine whether the Styloid process is elongated or not. The Panoramic radiographs or images are most useful clinically for diagnosing disorders related to facial structures including maxillary and mandibular bones and their supporting structures<sup>13</sup>. Although PRs have an important role for demonstrating the variations in the lengths of Styloid process, though they are not able to show the orientation and dimensions of the bone. The multislice computed tomography (MSCT) provides a reliable visualization of this features<sup>14-16</sup>. However, many reports have shown that SPE was not the only reason of the symptoms and signs of this, and they also suggested that other factors such as mediolateral angling (MLA), anteroposterior angling (APA) and the bending of the SP head were also important. Therefore, radiographic imaging may be enough for the patients with Eagle's syndrome who has the structure of normal bone. If there is any complication regarding this bone like tumor<sup>17</sup>, osteomyelitis<sup>18</sup> or fracture<sup>19</sup>, this complication could be easily detected by bone scintigraphy due to the high sensitivity of this imaging method<sup>20</sup>.



**Figure 3:** An elongated styloid process

#### Symptoms of Elongated Styloid Process

Patients with the elongated styloid process may show different symptoms one of which the most common one is that headache and cervical pain etc. Myocardial infarction, tinnitus, dysphagia, sore throat, otalgia etc are caused by the compression of carotid nerve plexus. It also compresses many nerves passing near that area like vagal nerve, inter jugular vein, glossopharyngeal nerve, facial nerve, hypoglossal nerves which may lead to further complications and leads to death.

#### CONCLUSION

The awareness of the incidence of the elongated styloid process is essential for a surgeon, to evaluate a patient with history of cervical pain. The knowledge of the embryology of the styloid apparatus and the structures related to it helps in proper diagnosis and treatment of eagle's syndrome. So, the dentists in the knowledge of this disease in order to include it in the differential diagnosis associated with atypical pain in the face or oral cavity in order to facilitate best treatment for these cases.

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