

# Co-Relation Between Presence Of Ponticulus Posticus On The Lateral Cephalogram With Cervical Pain And Vertigo

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## ABSTRACT:

**Aim & Objectives:** The objective of the study was to find out the co-relation between presence of different forms of ponticulus posticus and their association with cervical pain and vertigo.

**MATERIAL & METHODS:** The prospective single blinded study was conducted with a sample size of 400 patients (200 male and 200 female) who were referred to the Department of Oral Radiology for Lateral Cephalogram and who also fulfilled the inclusion and exclusion criteria. The patients were given a preformatted questionnaire to be filled following which their Lateral Cephalogram was made. Subsequently, the radiographs were analysed for the presence of Ponticulus Posticus.

**Results:** Out of 400 patients studied, 28 patients had cervical pain and 68% of them showed presence of ponticulus posticus on the lateral cephalogram. While in the 3 patients with vertigo, 67% of them showed the presence of ponticulus posticus.

**Conclusion:** We concluded that there was a high association of ponticulus posticus with cervical pain and vertigo.

**Key words:** ponticulus posticus, cervical pain, vertigo, oro facial pain, lateral cephalogram.

## 1. INTRODUCTION

**Ponticulus posticus** is a frequently encountered normal variant of the atlas vertebrae and is easily appreciated on a lateral cephalogram. It is seen in the posterior arch of atlas in relation to vertebral artery. An overall incidence of ponticulus posticus has been reported to be 16.7%<sup>1</sup>. Presence of ponticulus posticus is thought to be associated with reduced blood circulation leading to headache, vertigo, diplopia, musculoskeletal problems and cervical pain. The study was planned to find out the association between presence of ponticulus posticus on the lateral cephalogram with cervical pain and vertigo. If there exists a positive co-relation between them then the Dentist/Radiologist should routinely evaluate Lateral

cephalogram for presence of ponticulus posticus.

## 2. MATERIALS AND METHODS

The prospective single blinded study was conducted with a sample size of 400 patients (200 male and 200 female) who were referred to the Department of Oral Radiology for lateral cephalogram and who also fulfilled the inclusion and exclusion criteria.

The ethical clearance was obtained from the Institutional ethics committee for conducting the study.

The inclusion criteria consisted of all the patients referred for lateral cephalogram in the age range of 10 to 20 years and have agreed to be a part of the study after signing the informed consent form. Exclusion criteria consisted of patients with dental anomalies which are likely to affect the interpretation of lateral cephalogram. Patients with osseous jaw defects were also excluded from the study.

All the patients selected for the study were given a preformatted questionnaire to fill which assessed the patient's history of cervical pain and vertigo. Lateral cephalogram was made using CareStream CS 8500 C Unit and the image obtained was analyzed using the Trophy Dicom Software.

The images were exported as a JPEG image and were analyzed by a senior radiologist for the presence/absence of ponticulus posticus which is seen in relation to first cervical vertebrae. If present they were further classified as complete or partial type of ponticulus posticus. Refer to images A,B,C.



Absent



Partial



Complete

*Ponticulus Posticus On The Lateral Cephalogram*

The questionnaire and the data from the radiographic analysisi was then co-related. The data was then statistically analyse using using SPSS version 20:0. Chi-square test was used to compare the outcome with various qualitative data variables. Mann-Whitney U test used to compare the outcome with various quantitative data variables. p-value < 0.05 was considered as significant.

**3. RESULTS:**

Ponticulus posticus (PP) is a normal anatomical variant of atlas vertebrae (C1) and resides in the posterior arch of atlas in relation to vertebral artery forming frequently an incomplete or rarely a complete bridge. In our study we co-related the prevalence of ponticulus posticus on lateral cephalogram and its association with gender, cervical pain and vertigo.

Table 1 –Co-relation between gender and type of ponticulus posticus on lateral cephalogram.

|        |        | PP       |         |        | Total |
|--------|--------|----------|---------|--------|-------|
|        |        | Present  |         | Absent |       |
|        |        | Complete | Partial |        |       |
| Gender | Male   | 11       | 47      | 142    | 200   |
|        | Female | 6        | 59      | 135    | 200   |
| Total  |        | 17       | 106     | 277    | 400   |

P value = 0.56

Out of 400 lateral cephalogram evaluated,123 lateral cephalograms showed the presence of ponticulus posticus (31%) , while the remaining 277 were normal. Of the 123 which showed the presence of ponticulus posticus, 17 lateral cephalograms showed complete type(14%), while 106 lateral cephalograms showed partial type (86%).

Out of 400 lateral cephalogram that were evaluated,200 were male patients and 200 were female patients.65 lateral cephalogram of female patients and 58 lateral cephalogram of male patients showed presence of ponticulus posticus ,thereby pointing to a slight female predilection in the study. Also, partial type of ponticulus posticus was found to be more prevalent than complete type.

Table 2- The co-relation between history of cervical pain and presence of ponticulus posticus on the lateral cephalogram.

| Ponticulus Posticus |         |         |        |       |
|---------------------|---------|---------|--------|-------|
|                     |         | Present | Absent | Total |
| Cervical Pain       |         |         |        |       |
|                     |         |         |        |       |
|                     | Present | 19      | 9      | 28    |
|                     | Absent  | 104     | 268    | 372   |
|                     | Total   | 123     | 277    | 400   |

Out of total 400 patients in the study, 28 patients gave history of cervical Pain and 372 patients did not have any such history. Of the 28 patients with history of cervical pain ,19 (67.9%) showed presence of ponticulus posticus on lateral cephalogram. Of the 372 patients with no history of cervical pain only 104 (27.9%) showed the presence of ponticulus posticus on the lateral cephalogram. Therefore the incidence of ponticulus posticus was found to be significantly higher in patients with cervical pain and thin difference was found to be statistically and clinically significant.

Table 3- Co-relation between the type of ponticulus posticus on lateral cephalogram and its association with cervical pain

| Ponticulus Posticus |         |          |         |       |
|---------------------|---------|----------|---------|-------|
|                     |         | Complete | Partial | Total |
| Cervical Pain       |         |          |         |       |
|                     |         |          |         |       |
|                     | Present | 5        | 14      | 19    |
|                     | Absent  | 12       | 92      | 104   |
|                     | Total   | 17       | 106     | 123   |

Out of the 17 patients who had complete type of ponticulus posticus on the lateral cephalogram, 5(25.4%) patients had cervical pain, while out of 106 patients who had partial type of ponticulus posticus on the lateral cephalogram 14(13.2%) patients had cervical pain. Therefore there seems to be a high co-relation between complete type of ponticulus posticus on lateral cephalogram and cervical pain, and there is moderate co-relation between partial type of ponticulus posticus on lateral cephalogram and cervical pain. The difference between complete type of ponticulus posticus and partial type of ponticulus posticus and their co-relation with cervical pain was found to be statistically significant.

Table 4- The co-relation between history of vertigo and presence of ponticulus posticus on the lateral cephalogram.

| Ponticulus Posticus |         |         |        |       |
|---------------------|---------|---------|--------|-------|
|                     |         | Present | Absent | Total |
| Vertigo             |         |         |        |       |
|                     | Present | 2       | 1      | 3     |
|                     | Absent  | 121     | 276    | 397   |
|                     | Total   | 123     | 277    | 400   |

Out of total 400 patients in the study, 3 patients gave history of vertigo and 397 patients did not have any such history. Of the 3 patients with history of vertigo, 2 (66.7%) showed presence of ponticulus posticus on lateral cephalogram. Of the 397 patients with no history of cervical pain only 121 (30.5%) showed the presence of ponticulus posticus on the lateral cephalogram. Therefore the incidence of ponticulus posticus was found to be significantly higher in patients with vertigo and this difference was found to be statistically and clinically significant.

Table 5- Co-relation between the type of ponticulus posticus on lateral cephalogram and its association with vertigo

| Ponticulus Posticus |         |          |         |       |
|---------------------|---------|----------|---------|-------|
|                     |         | Complete | Partial | Total |
| Cervical Pain       |         |          |         |       |
|                     | Present | 0        | 2       | 2     |
|                     | Absent  | 17       | 104     | 121   |
|                     | Total   | 17       | 106     | 123   |

Out of the 2 patients who had partial type of ponticulus posticus on the lateral cephalogram, both patients (100%) had vertigo, while no patients who had complete type of ponticulus posticus on the lateral cephalogram had vertigo. Therefore there seems to be a high correlation between partial type of ponticulus posticus on lateral cephalogram and vertigo, and there is no correlation between complete type of ponticulus posticus on lateral cephalogram and vertigo. Therefore we can conclude that there is high association of partial type of ponticulus posticus and vertigo in the study population. The difference was found to be statistically non-significant.

#### 4. DISCUSSION

Ponticulus Posticus means “little posterior bridge” in Latin. It is defined as an abnormal small bony bridge which is formed between the posterior portion of the superior articular process and the posterolateral portion of the superior margin of the posterior arch of the atlas and is often observed on the lateral cephalogram of the cervical spine<sup>2</sup>. Casual movements like flexion and extension of neck or continuous trauma in persons with ponticulus posticus can compress and restrict movement of vertebral artery<sup>19</sup>. Owing to this, many cases have resulted in stroke especially in children<sup>19</sup>.

In our study there was slight female predilection.

Tambawala SS et al<sup>1</sup>(2017), Parita Chitroda et al<sup>2</sup> (2012) Gupta Mudit et al<sup>3</sup> (2012) , Poornima Govindraju et al<sup>4</sup>(2016), showed slight similar results. While others like V Sharma et al<sup>5</sup> (2009), showed slight male predilection and Jamal Giri et al<sup>6</sup>(2017) Elliotte RE et al<sup>15</sup>(2014), showed no significant association between gender of the patient and presence of ponticulus posticus.

In our study population the overall incidence of partial type of ponticulus posticus was more than that of complete type.

Poornima Govindraju et al (2016), Tambawala SS et al<sup>1</sup> (2017), Jamal Giri(2017)<sup>6</sup>, Baba IA et al<sup>7</sup> (2015) also showed similar results. Whereas some studies like Schilling J et al<sup>14</sup> and Cakmak O et al<sup>16</sup> showed prevalence of complete type of ponticulus posticus was more. In a study Sabryna Renata Closs et al<sup>8</sup> (2017) concluded that there is no co-relation between gender and ponticulus posticus.

Association between ponticulus posticus and cervical pain or vertigo is important due to the complications resulting from the damage caused due to compression of the vertebral artery because of presence of this bony ridge. The complete type of ponticulus posticus has very high association with cervical pain as it compresses the vertebral artery to a greater extent thus causing cervical pain than partial type of ponticulus posticus.

So, according to our study, there seems to be a high co-relation between complete type of ponticulus posticus on lateral cephalogram and cervical pain and there is moderate co-relation between partial type of ponticulus posticus on lateral cephalogram and cervical pain, whereas in vertigo patients, the partial type of ponticulus posticus was highly associated with presence of ponticulus posticus.

Studies like Wight S et al<sup>10</sup> , Schilling J et al(2010)<sup>14</sup>, Cakmak O et al<sup>16</sup> (2005) showed similar results for presence of ponticulus posticus and its association with cervical pain and vertigo.

In Wight et al(1999)<sup>10</sup>,Forty-six percent of the sample were men and the predominant complaint was neck pain (33%). Most patients were in the fourth decade of life.

In Cakmak O et al<sup>16</sup>, the statistical evaluations showed that patients with complete arcuate foramen had significant complaints of shoulder-arm pain, neck pain and vertigo compared to patients with incomplete arcuate foramen.

## 5. CONCLUSION

It was concluded there is no sex influence in presence of ponticulus posticus, indicating that gender is not an influencing factor. We concluded that although the prevalence of cervical pain and vertigo is very less there is high association of ponticulus posticus with cervical pain and vertigo, in the study population. Complete type of ponticulus posticus is highly associated with cervical pain, while partial type of ponticulus posticus is highly associated with vertigo. Therefore it is suggested that in patients who have cervical pain or vertigo with unknown cause the presence of ponticulus posticus should be ruled out. Also in patients showing presence of ponticulus posticus on lateral cephalogram, a thorough evaluation of a history of cervical pain or vertigo should be done.

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