Pain

Evaluation of platybasia in patients with idiopathic trigeminal neuralgia

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Received 28 June 2006; accepted 9 August 2006

Abstract

\textbf{Background:} Vascular compression of the trigeminal nerve is generally accepted as the primary source causing TN. To date, skull base bone deformity associated with ITN has been reported in only a number of case reports. The aim of the present study was to investigate one such skull base deformity, platybasia, in ITN patients in comparison with a randomized control population.

\textbf{Methods:} Basal angle values reflecting the development of platybasia were measured in 25 patients with ITN and compared with the measurements in 25 control subjects.

\textbf{Results:} Basal angle measured to investigate the existence of platybasia was found significantly wider in the ITN group ($t = 3.90; P < .001$), although platybasia was present in only 10 patients. Moreover, the average angle was also greater in the study group than in the control group, and the difference was statistically significant. Platybasia was found in 10 patients, whereas it was detected in only 2 control individuals; difference in platybasia incidence between the 2 groups was also statistically significant ($\chi^2 = 7.01; P < .01$).

\textbf{Conclusion:} Our data demonstrated that platybasia affecting the bony walls of the posterior fossa may play an important role in the pathogenesis of vascular abnormalities causing TN.

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\textbf{Keywords:} Platybasia; Skull base deformity; X-ray; Trigeminal neuralgia

1. Introduction

In spite of progress in both science and medicine, the cause of ITN has not been explained fully [7,15]. Vascular compression of the trigeminal nerve in the cerebellopontine angle is now generally accepted as the primary source causing TN [6,8]. However, in some cases, the evidence of neurovascular conflict could not be detected during microvascular decompression [5,8,10,14-16,19]. The reported percentages of cases without neurovascular conflict vary from 1.4% [10] to 28.5% [16]. Furthermore, TN associated with deformity at the skull base has been reported in only a number of cases [2,4,12,13,17]. In such cases, so-called crowding of the posterior fossa is thought to be the responsible cause of the neuralgia [17]. It is clear that further investigations are needed to assess other potential causes of TN.

During his experience in the treatment of TN over the last 30 years, the senior author (YK) observed skull base deformity in some of his ITN patients. Nevertheless, a literature search revealed no randomized controlled study focused on association of skull base deformity in ITN patients. Therefore, a prospective randomized controlled study was designed to investigate one such skull base deformity, platybasia, in ITN patients in comparison with a randomized control Turkish population.

2. Patients and methods

2.1. Patient population

The study group consisted of 25 patients (12 men, 13 women; age range, 49-84 years; mean age, 61.88) with ITN consecutively treated in our institute. Other characteristics...
of the patients are shown in Table 1. Patients with electric shock-like, paroxysmal pain without pathological findings on MRI or CT scans were accepted as having ITN. Lateral skull x-rays in which identification of TS, DS, B, O, and N was possible in the scans were evaluated prospectively. Because accurate x-ray techniques are essential for correct angles, true lateral skull x-rays were obtained, in which the central ray is perpendicular to the film and centered over the midportion of the skull [9].

The control group consisted of 25 healthy Turkish individuals (12 men, 13 women; age range, 45-82 years; mean age, 62.88). Demographics of the control group are given in Table 2. Lateral cervical x-rays were evaluated in the control group as well.

### 2.2. Angle measurement

Welcher’s BA measurements were performed to assess platybasia. This BA is formed by the N, TS, and B. It is obtained by tracing a line from the N to the TS and from there to the B. Any value exceeding 140° was accepted as platybasia [11,18] (Fig. 1).

### Table 1

<table>
<thead>
<tr>
<th>No.</th>
<th>Age/Sex</th>
<th>Location of TN</th>
<th>BA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>55/F</td>
<td>LV2, 3</td>
<td>128</td>
</tr>
<tr>
<td>2</td>
<td>52/M</td>
<td>LV2, 3</td>
<td>126</td>
</tr>
<tr>
<td>3</td>
<td>61/M</td>
<td>LV2, 3</td>
<td>138</td>
</tr>
</tbody>
</table>
| 4   | 69/M    | RV2, 3         | 143  
| 5   | 76/M    | RV3            | 133  
| 6   | 54/F    | RV3            | 148  
| 7   | 70/F    | LV2, 3         | 152  
| 8   | 65/F    | LV2, 3         | 135  
| 9   | 74/F    | RV2, 3         | 146  
| 10  | 49/F    | RV2, 3         | 135  
| 11  | 52/F    | LV3            | 142  
| 12  | 60/M    | LV3            | 138  
| 13  | 57/M    | LV3            | 132  
| 14  | 62/F    | LV2, 3         | 142  
| 15  | 56/M    | LV3            | 146  
| 16  | 51/M    | LV3            | 141  
| 17  | 56/M    | RV3            | 146  
| 18  | 82/F    | RV1, 2, 3      | 142  
| 19  | 65/M    | LV3            | 136  
| 20  | 49/F    | RV2            | 138  
| 21  | 74/M    | RV3            | 132  
| 22  | 84/M    | RV2, 3         | 140  
| 23  | 68/F    | LV3            | 135  
| 24  | 55/F    | RV2, 3         | 134  
| 25  | 51/F    | LV2            | 130  

M indicates male; F, female; L, left; R, right.

*a* Platybasia.

### Table 2

<table>
<thead>
<tr>
<th>No.</th>
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| 16  | 77/F    | 120  
| 17  | 62/F    | 128  
| 18  | 55/F    | 130  
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*a* Platybasia.
Our data demonstrated that platybasia affecting the bony walls of the posterior fossa may play a role in the pathogenesis of TN. Volumetric evaluation of the posterior fossa and cerebellopontine angle might be helpful in explaining the pathogenesis of ITN.

Acknowledgment

This paper is gratefully dedicated to our master, Bozkurt Guvenc, Professor of Social Anthropology, the member emeritus of the Turkish Academy of Science.

This work is partly supported by Turkish Academy of Sciences. We thank Professor Omer SATICI from the Department of Biostatistics, School of Medicine, Dicle University, for his work in statistical analyses.
References


Commentary

The authors reported an interesting study to demonstrate the correlation between platybasia and TN. They used the Welcher’s basal angle measurements on the lateral view of plain skull x-ray to define the platybasia, the normal upper limit being 140°. They measured basal angle in 25 patients with TN and compared the data with those from 25 normal subjects. The results showed that the average basal angle was significantly wider in the TN group than that in the control group. Moreover, platybasia was found in 10 patients, whereas it was found in only 2 subjects from the control group. Obviously, the incidence of platybasia in the 2 groups was markedly different. Consequently, they concluded that platybasia affecting the bony wall of posterior fossa may play an important role in the pathogenesis of vascular abnormalities causing trigeminal neuralgia.

Basilar impression or platybasia is the most common craniovertebral junction abnormality, wherein normal relations between the skull base and cervical vertebrae are altered. The terms basilar impression and platybasia are commonly used interchangeably; platybasia is solely restricted to a widening basal angle, the upper normal limit being 143° [3]. Although various neurological disturbances may arise, the reports regarding platybasia associated with trigeminal neuralgia are rare.

There are 2 methods to define the basilar impression on the lateral view of the skull x-ray: Chamberlain’s and McGregor’s. McGregor’s line is the line drawn from the posterior end of the hard plate to the lowest portion of the occipital bone; normally, the tip of the odontoid process should not exceed 5 mm above the line. The accuracy of the measurement of the basal angle depends on the correct x-ray techniques to obtain a true lateral skull view. In this article, the quality of the lateral view in Fig. 1 was not as good as that in Fig. 2. On the other hand, if the authors used the other reference line, such as McGregor’s line, to evaluate the platybasia and compared it with the present study, the conclusion might be more informative.

Since the introduction of CT and MRI imaging, the reference landmarks used to measure the basal angle became more clearly identifiable, and hence, the measuring results are more consistent and perhaps more reliable.

Based on the study of basal angle of normal Chinese subjects measured by standard MRI technique, the average basal angle is 121° ± 5.8° [2]. The angle is relatively smaller than that of normal subjects from the United States (129° ± 6°, from Koenigsberg et al [1]). The relatively smaller basal angle is presumed because of the habit of supine sleeping posture of Chinese people who have relatively wide face and flat posterior head.

It would be interesting to know whether evaluation of platybasia using MRI technique in patients with TN and in normal subjects might have the same conclusion as that of the present study.