
Contribution to the Etiological Explanation of the Piriformis Syndrome

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Key words. Sciatic nerve · M. piriformis · Causal agents of sciatic pain

Abstract. The author investigated in 130 anatomical specimens the topographical relations of the sciatic nerve and the musculus piriformis in order to explain the clinical syndrome of the m. piriformis.

The author found that in 6.15% of cases the nervus peroneus communis passes between the tendinous parts of the m. piriformis, and he considers this variation of practical significance for the development of the ‘piriformis syndrome’. In upward rotation of the thigh, the m. piriformis is extended and the tendons of the divided muscle are tightly pressed together thus pinching the nerve between them. Pinching of the nerve causes the characteristic sciatic pain. In such a case, the patient can be relieved by cutting one of the tendons.

Introduction

The ‘piriformis syndrome’ represents a clinical entity characterized by sensory, motor and trophic disturbances in the innervation area of the sciatic nerve.

Yeoman [1928] was the first to stress and to point out the clinical significance of the anatomical relations of the sciatic nerve and the musculus piriformis in the etiology and pathogenesis of ischialgia. The causal agents of ischialgia due to nerve stimulation by the m. piriformis may be grouped as follows:

(a) Excitatory reflex spasm of the muscle due to stimulation at its origin, i.e. the sacroiliac joint [Yeoman, 1928; Freiberg and Vinke, 1934; Haggart, 1938; Hershey, 1943; Robinson, 1947; Hoff, 1949] or at the attachment by inflammation of the trochanteric bursa due to general involvement of the trochanter [Hoff, 1949; Topličane and Dürrigl, 1966].

(b) Inflammatory degenerative changes of the muscle and its fasciae [Albee and Bonica; cited by Freiberg, 1937].

(c) More severe static deformities setting up disharmony in the relationship between the length of the muscle and the distance of the bony origin and attachment of the muscle [Hoff, 1949].

(d) The abnormal nerve passage itself through the m. piriformis may lead to ischialgia due to compression of nerve and concomitant arteries [Freiberg and Vinke, 1934; Beaton and Anson, 1938; Pećina, 1975].

The clinical piriformis syndrome comprises two essential points, so far insufficiently elaborated: (1) clarification of the causal agent and development of the syndrome; (2) surgical treatment of the syndrome.
Table I. Frequency of sciatic nerve passage through the m. piriformis

<table>
<thead>
<tr>
<th></th>
<th>Both sides</th>
<th>Right n</th>
<th>%</th>
<th>Left n</th>
<th>%</th>
<th>Total n</th>
<th>%</th>
</tr>
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<tbody>
<tr>
<td>Male</td>
<td>7</td>
<td>16.27</td>
<td>10</td>
<td>23.25</td>
<td>11</td>
<td>25.58</td>
<td>21</td>
</tr>
<tr>
<td>Female</td>
<td>2</td>
<td>9.09</td>
<td>3</td>
<td>13.63</td>
<td>3</td>
<td>13.63</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>13.89</td>
<td>13</td>
<td>20.00</td>
<td>14</td>
<td>21.54</td>
<td>27</td>
</tr>
</tbody>
</table>

Table II. Frequency of peroneal nerve division passage through the divided m. piriformis

<table>
<thead>
<tr>
<th></th>
<th>Right n</th>
<th>%</th>
<th>Left n</th>
<th>%</th>
<th>Total n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>8</td>
<td>18.6</td>
<td>8</td>
<td>18.6</td>
<td>16</td>
<td>18.6</td>
</tr>
<tr>
<td>Female</td>
<td>3</td>
<td>13.63</td>
<td>2</td>
<td>9.09</td>
<td>5</td>
<td>11.36</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>16.92</td>
<td>10</td>
<td>15.38</td>
<td>21</td>
<td>16.15</td>
</tr>
</tbody>
</table>

Table III. Frequency of nerve passage between the tendinous parts of the divided m. piriformis

<table>
<thead>
<tr>
<th></th>
<th>Right n</th>
<th>%</th>
<th>Left n</th>
<th>%</th>
<th>Total n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>2</td>
<td>4.65</td>
<td>3</td>
<td>6.97</td>
<td>5</td>
<td>5.81</td>
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<tr>
<td>Female</td>
<td>2</td>
<td>9.09</td>
<td>1</td>
<td>4.54</td>
<td>3</td>
<td>6.81</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>6.15</td>
<td>4</td>
<td>6.15</td>
<td>8</td>
<td>6.15</td>
</tr>
</tbody>
</table>

We decided hence to investigate in detail the anatomico-topographical relations of the sciatic nerve and its branches at its origin from pelvis minor as well as the relations between the sciatic nerve and the m. piriformis.

Material and methods

Investigations were carried out on 65 corpses of both sexes (from 24 to 87 years of age), i.e. on 130 specimens of the lower extremity. In this material, variations of the relationship between the m. piriformis and the sciatic nerve were studied and particular attention was paid to the investigation of passage incidence of the peroneal part of the nerve through the undivided or divided muscle; passage incidence of the nerve through the muscle in the upper division of the sciatic nerve, and passage incidence of the nerve through the divided muscle with special regard to the passage of the nerve between its tendinous parts.

In order to determine the level of the division of the sciatic nerve, histological sections of the nerve were carried out at various levels of its course and stained with hemalum-eosine.

Results

The results obtained are reported in tables I–III. We found that the nervus peroneus com-
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Fig. 2. N. peroneus communis passes through the divided m. piriformis. It is in relation with the tendon of the upper and the muscular fibres of the lower part of the muscle.

Fig. 3. Schematic drawing of all possible variations of the sciatic nerve and m. piriformis. Demonstration of personal results concerning the frequency of the different variations.

munis passes in 27 specimens, i.e. in 20.77% of cases through the m. piriformis (table I). In 6, 4.6% (fig. 1) of 27 specimens in which the nerve pierces the m. piriformis, it passes through the undivided muscle while in the other 21 specimens (16.15%), the nerve passes between the two portions of the divided muscle (fig. 2, table II). In 1 female specimen, the sciatic nerve formed a pedicle around the m. piriformis. The variations of the sciatic nerve and the m. piriformis described in the literature as well as those cited merely hypothetically are presented in figure 3. The subdivision level of the sciatic nerve was studied histologically and by the naked eye. The results of investigations of the subdivision level of the sciatic nerve are presented in figure 4.

In view of the histological examination, we may conclude that the observation by the naked eye and the microscopically determined division of the sciatic nerve are not entirely conform.

By comparing our data on the incidence of high-level division of the sciatic nerve and the passage incidence of n. peroneus communis through the m. piriformis we found that there
exists an interrelation between these two parameters, i.e. the incidence of the high-level division (intrapelvic division of the sciatic nerve) and the passage of the n. peroneus communis through the m. piriformis.

We may thus conclude that in case of high-level division of the nerve, one branch of the sciatic nerve – and this is almost exclusively n. peroneus communis – passes through the muscle and only exceptionally above the muscle.

According to our investigations, the passage of the sciatic nerve through the m. piriformis is a common variation and particularly the passage of the peroneal portion of the nerve.

In the pathogenesis of ischialgia there is, however, a particularly significant relationship in which the nervous trunk or a portion of the nerve passes between the tendinous portions of the muscle (fig. 5). In 8 of our specimens, i.e. 6.15% of cases, the n. peroneus communis passes between the two tendinous parts of the divided m. piriformis (table III) and in 13 speci-
mens (10.0% cases), the nerve is in contact with one tendon of the divided muscle (fig. 2).

From table III it is evident that there is no difference in the incidence of the nerve passage between the tendinous portions of the m. piriformis on the right and left sides of the investigated specimens. The nerve, however, passes more commonly between two tendons in female specimens (6.81%) than in male ones (5.81%). There was not a single case in which the nerve passed on both sides between the tendinous portions of the m. piriformis.

Discussion

There is disagreement as to the passage incidence of the sciatic nerve through the m. piriformis [Pecina, 1969; Ilić et al., 1976].

Sappey [1876] was the first to find the m. piriformis occasionally divided into two portions between which one portion of the sciatic nerve may pass. Mourer [1893] concluded that in case of high-level division of the sciatic nerve n. peroneus communis passes through the m. piriformis.

Beaton and Anson studied in detail variations in the relationship of the sciatic nerve and the m. piriformis in several works issued between 1930 and 1940. Berkol et al. [1935], emphasized that sex and side do not play an important part in the passage incidence of the n. peroneus communis through the m. piriformis. Odajima and Kurihara [1963] found the n. peroneus communis to pierce the m. piriformis more commonly in males and on the left side. Trotter [1932] stated that there is no difference due to sex. Nevertheless, he found that n. peroneus communis pierces the m. piriformis in Whites more commonly than in Negroes.

Many authors pointed out that the passage of the peroneal portion of the nerve through the muscle appears regularly in the high-level division of the sciatic nerve [Vallois, 1929; Clara, 1942; Lazorthes, 1955].

The clinical significance of the passage of the n. peroneus communis through the m. piri-
formis has not been accentuated enough. Kopell and Thompson [1960], in their report on canalicular damage to the nerves of the lower extremity, described the variations in the relationship of the sciatic nerve to the m. piriformis, but failed to insist on the clinical significance of these variations. Freiberg [1937] merely illustrated such a possibility of nerve irritation but without a more detailed explanation. Since the peroneal portion of the nerve passes relatively frequently between the tendinous portions of the m. piriformis, this fact should be borne in mind in patients with an obscure etiology of ischialgia. In such a case, in our opinion conservative therapy will not lead to improvement. The only causal therapy is to cut through one of the tendons of the m. piriformis.

**Conclusion**

We consider that the passage of the nerve or of its branch through the muscular portion of the m. piriformis cannot, in any condition of the muscle, exert pressure on the nervous fibers, since muscular fibers despite their contraction do not acquire, under normal conditions, such a firm consistency as to damage nervous fibers by compression. On the other hand, we consider the anatomical relationship when the nervous trunk or a portion of the nerve passes between the tendinous portions of the muscle to be significant for the etiology of ischialgia. In such a case, compression of the nerve is brought about not during muscular contraction, i.e. outward rotation of the thigh, frequently cited in the literature as the cause of ischialgia but on the contrary, by passive stretching of the muscle during inward rotation of the thigh.

Inward rotation of the thigh stretches the m. piriformis, the tendons firmly adhere and the nervous fibers are wedged in between the tendinous portions of the muscle which results in characteristic sciatic pain.

On the contrary, in outward rotation of the thigh, i.e. active contraction of the m. piriformis, the muscular tendons are pushed aside and the nerve is freed of compression (fig. 6).

**References**


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Received: October 12, 1978

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