Sciatic Nerve: Site of Division into Tibial and Common Peroneal Nerve and Clinical Implications.

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**Background:** A description of the location of division of the sciatic nerve into tibial and common peroneal nerve in Thai subjects is not available. A precise knowledge is desirable for execution of safe surgical intervention and the like. Various textbooks and reports description are diversified and most without exact percentage for each site.

**Objective:** To determine the exact location of sciatic nerve into its major branches of tibial and peroneal nerve in Thai subject.

**Design:** Descriptive study.

**Setting:** Department of Anatomy, Faculty of Medicine Chiangmai University, Chiangmai, Thailand.

**Subjects:** The study was carried out on sixty-five cadavers (130 specimens), age ranged from fourteen to ninetynine years of both sexes.

**Measurement:** The length from the point of the sciatic nerve emergence underneath the belly of the piriformis to the point of its branching and also to the lateral condyle of the femur in centimeters.

**Results:** The division pattern was classified into four types. In 40.7% (of 130 specimens) division was at the level of the femoral condyle (Type II), in 25.3% it was at the gluteal region (Type III), in 24.6% at about the popliteal space (Type IV), in 8.4% at the mid-thigh level (Type IV) and only one specimen at the lower third of the thigh.

**Conclusions:** Briefly stated, sciatic nerves in Thais divide 65% in the knee, 25% in the gluteal region and the rest in the thigh. These findings would have strong clinical implications in surgical, anaesthetic and rehabilitative interventions.
Introduction

Injury to the sciatic nerve causes a devastating catastrophe; entailing muscular weakness, joint contracture, limb deformities, trophic ulcerations and abnormal gait. Knowledge of its exact anatomy is thus a key to successful surgical, anaesthetic and rehabilitative interventions.

The sciatic nerve is the largest branch contributed by the lumbosacral plexus. It really consists of two nerves, the tibial and the common peroneal, bound together in the same sheath to form the largest nerve in the body with a width of about two centimeters, leaving the pelvis through the greater sciatic foramen, underneath the belly of the piriformis muscle, covered by the glutus maximus muscle. It then branches into two major components, namely the common peroneal nerve and the tibial nerve. The precise point of branching of the nerve is described differently in various text books; in the pelvis, the gluteal region, upper thigh, mid thigh, distal thigh or lower third of thigh, upper part or apex of popliteal fossa. However, the specimens that we self-donated to use for teaching our medical students were found to have a much different pattern of division. Searching of records could not provide any prior study of the sciatic nerve branching in any Thai literature. We thus endeavored to study the location of the main branching of the sciatic nerve in Thai subjects.

Material and Methods.

A study was carried out on sixty-five cadavers of both sexes (thirty-nine male, twenty-six female), aged between fourteen and ninety-two years. All were Thai who had donated their bodies for teaching medical and paramedical as well as post-graduate students at the department of Anatomy, Faculty of Medicine, Chiangmai University.

Dissection was carried out by removing the skin down to muscular level from the gluteal region to the back of the knees. The glutus maximus muscle was detached from its medial attachment, starting from its lower border, reflecting it completely laterally. The glutus medius muscle would now come into view, deltoid cheng it from its insertion and lifting it up to expose the gluteus minimus and the perfronms. The sciatic nerve could now be located at the distal border of the perfronms muscle. The nerve could be followed to the point of its branching into the two major components of tibial and common peroneal nerves. Measurement was the made of the length from the point of its emergence underneath the belly of the perfronms to the point of its branching and also to the lateral condyle of the femur.

The dissection was carried out on each cadaver by two post-graduate students simultaneously on each side under the supervision of the authors and the measurements were made by one of the authors (P.M.).

Results

There were 130 specimens in sixty-five cadavers from thirty-nine males and twenty-six females, age fourteen to ninety-two years, as shown in Table 1. All sciatic nerves passed beneath the perfronms muscle. Of these, the point of branching into the two major components of tibial and common peroneal nerves of each could be grouped into four types, namely:

<table>
<thead>
<tr>
<th>Age</th>
<th>Length from perfronms muscle to sciatic nerve branching (cm.)</th>
<th>Specimens</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right</td>
<td>Left</td>
</tr>
<tr>
<td>38-86</td>
<td>0.07</td>
<td>13</td>
</tr>
<tr>
<td>14-83</td>
<td>32/02</td>
<td>40/40</td>
</tr>
<tr>
<td>56-77</td>
<td>18/07</td>
<td>20/40</td>
</tr>
<tr>
<td>36-92</td>
<td>30.5/32</td>
<td>33/40</td>
</tr>
<tr>
<td>77</td>
<td>33/45</td>
<td></td>
</tr>
<tr>
<td>Summation</td>
<td></td>
<td>65</td>
</tr>
</tbody>
</table>

(DU = Division at the point of emergence from the perfronms)
Type I: At the level of the femoral condyle (Figure I and Diagram I).
There were thirty-four cadavers with twenty-one males (32.3%) and thirteen females (20.0%) making up a total of fifty-three specimens (40.7%) in this group. The detail is shown in Table II. No report or description of this pattern was described before.

Type II: At the gluteal region (Figure II and Diagram II).
This group comprised of twenty-one cadavers, ten males (15.0%) and eleven females (17.0%), thirty-three specimens (25.3%) in all as shown in Table II.

Type III: About the popliteal space: Not to exceed eight centimeters above the femoral condyle (Figure III and Diagram III).
There were twenty-two cadavers with twelve males (18%) and ten females (15%) making up a total of thirty-two specimens (24.8%) in this group. The detail is shown in Table IV.

Type IV: At mid-thigh level: Between eleven to twenty-five centimeters from popliteal (Figure IV and Diagram IV).
### Table II: Number, side and sex of cadavers and specimens branching at the femoral condylar region.

<table>
<thead>
<tr>
<th>Type</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total specimens (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symmetrical bilateral</td>
<td>15</td>
<td>4</td>
<td>38</td>
</tr>
<tr>
<td>Left side only</td>
<td>2</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Right side only</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Summation</td>
<td>21 (32.3)</td>
<td>13 (20)</td>
<td>33 (40.7)</td>
</tr>
</tbody>
</table>

![Figure III: Sciatic Nerve: Site of Division](image1)

![Figure IV: Sciatic Nerve: Site of Division](image2)

**Diagram III:** Site of division:
About the popliteal space (arrow)

**Diagram IV:** Site of division:
At midhigh level (arrow)
Table III: Number, side and sex of cadavers and specimens branching at the gluteal region.

<table>
<thead>
<tr>
<th>type</th>
<th>male (%)</th>
<th>female (%)</th>
<th>total specimen (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>symmetrical bilateral</td>
<td>5</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td>left side only</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>right side only</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>summation</td>
<td>10 (15)</td>
<td>11 (17)</td>
<td>32 (25.3)</td>
</tr>
</tbody>
</table>

Table IV: Number, side and sex of cadavers and specimens branching at about the popliteal space.

(not to exceed 8 cm. above the femoral condyle)

<table>
<thead>
<tr>
<th>type</th>
<th>male (%)</th>
<th>female (%)</th>
<th>total specimen (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>symmetrical bilateral</td>
<td>6</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>left side only</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>right side only</td>
<td>3</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>summation</td>
<td>12 (18)</td>
<td>10 (15)</td>
<td>32 (24.6)</td>
</tr>
</tbody>
</table>

Table V: Number, side and sex of cadavers and pectorals branching at the mid-thigh level.

(between 11-25 cm. from the patellae)

<table>
<thead>
<tr>
<th>type</th>
<th>male (%)</th>
<th>female (%)</th>
<th>total specimen (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>bilateral</td>
<td>3</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>unilateral</td>
<td>1*</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>summation</td>
<td>4* (6)</td>
<td>2 (3)</td>
<td>11 (6.6)</td>
</tr>
</tbody>
</table>

*Actually only 5 cadavers plus one specimen

There were 5.5 cadavers with four males and two females making up a total of eleven specimens (64.4%) in this group. The detail is shown in Table V.

Only one specimen from a male, seventy-seven, on the left side, divided at the level of the lower third of the thigh, while his right side at the mid-thigh level.

Further perusal revealed six cadavers with division of the nerve in the gluteal region on one side and at the femoral condyle on the other side. Of these three were male and the other three were female. All but one had the division on left buttock and right knee. The other had this vice versa (Figure V.)

Discussion

The relationship of the sciotic nerve to piformis muscle as quoted from a standard textbook is as followed. Of 640 limbs studied, 87.3 percent had both tibial and common peroneal divisions passing below piformis muscle, 12.2 percent had the peroneal division passing through piformis muscle, 0.5 percent had the peroneal division passing above. All sciotic nerves in our study passed below the piformis muscle, al-
though the number of our specimens (130) are much less.

Gosling et al., Moore2 and Snell2 described the division of the sciatic nerve in the pelvis although no percentage of the division is given. We found no speci-
men in our study dividing at this level.

Chiba. 531 reported a study of 514 sciatic nerves, 173 (30.5 percent) divided into tibial and common peroneal nerves about the piriformis muscle, i.e. in the glu-
teal region. We found 25.3 percent of our specimens dividing in this region. Craggs5, Gosling et al., Last6, Moore, Agur5 and Snell2 also described division of the sciatic nerve in this region but no exact percentage were
given.

Moore2 and Snell2 described the division of the sciatic in mid thigh. We found only 8.4 percent of our specimen branching at this level.

Many authors5,10-14 described the division of the sciatic nerve into the tibial and common peroneal nerves at the superior end of the popliteal fossa., and many others15,5,6,11 described it at the lower third of the thigh. Although they are at different levels, they are in quite a close proximity. And if we were to group them together, we can liken them to our Type III. Twenty-two cadav-
ers could then be allocated to this group with 32 speci-
mens (24.6%).

However, one of our specimens did divide at the lower third of the thigh. (While the opposite side divided in the mid-thigh.)

From the result of our study, Type I and Type III in combination make the largest group (of close proxim-
ity) of division about the knee. Fifty-six cadavers or
eighty-five specimens (65.4%). Thus more than half of the sciatic nerves in Thai individual divide into tibial and
common peroneal nerves at the knee region. Of these
three-thirds are males and twenty-three are females. While those divided in the mid-thigh account for only
8.4 percent in our series with no significant difference
between male and female.

The most interesting finding in this study is that
40.7 percent of our specimens division took place at
the level of the femoral condyle. This has not been
described before. More than half of the cadavers di-
vided at this level although only fifty-three individual
nerves (40.7%) did so, male did so more than female.
Thus from all these, 65.4% of the nerves divide in
the knee region, 25.3% in the gluteal region and the
rest in the thigh.

Equipped with these facts, a surgeon (a general
surgeon, a neurosurgeon or an orthopaedist) will be
better prepared for his task of carrying out a successful
surgical intervention for the patients7. In another as-
pect, a rehabilitation physician will be better facilitated in
carrying out nerve conduction study8-9 or nerve
stimulation9 or electrical stimulation to keep the bulk
of the muscle in rehabilitation of the patient10-11. An
anesthesiologist will likewise be better armed to carry
out nerve blocking on the sciatic, common peroneal,
or tibial nerve22,23.

Although this study was encountered with quite a
lot of variations to what had been described previously.
We do think that it would contribute to enhance the
successful execution of these interventions in general
or at least in the Thai population in the North.

Conclusion

Sciatic nerve divides into two major components of
tibial and common peroneal nerves at 4 locations ;
the gluteal region (25.3%), the mid thigh region (8.4%),
the popliteal space (24.6%) and the femoral condylar
region (40.7%).

Thus the division around the knee accounts for
more than half. Division at the femoral condylar region
is described here for the first time. Intracadaveric vari-
ations are noted quite commonly.

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References