

## Brief Communication

### The division level of the sciatic nerve and its relevance to popliteal nerve block. A cadaveric study

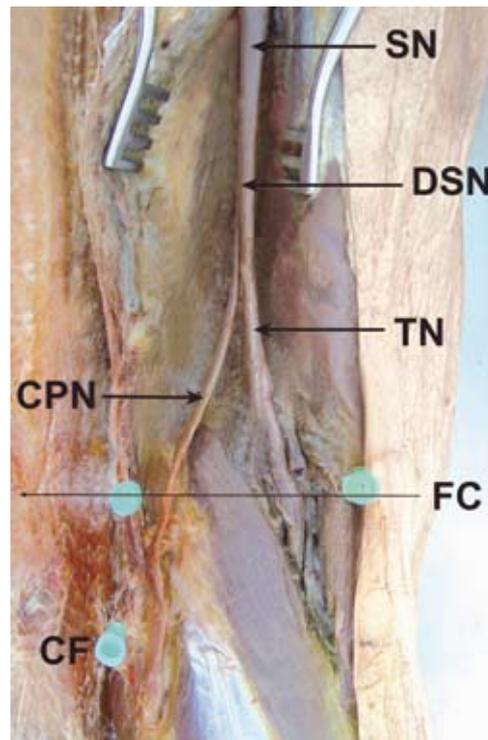
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Sciatic nerve (SN) block together with femoral nerve block can be used during surgical procedures on the lower extremities, however, in cases of trauma it may be contraindicated or inconvenient to change the position of the patient when performing lower extremity nerve blocks.<sup>1</sup> Numerous methods for performing a SN block in the popliteal fossa have been described.<sup>1</sup> The SN derives its fibres from the anterior roots of the L4–S3 spinal segments.<sup>2</sup> Amongst individuals, the site of separation of the tibial nerve and the common peroneal nerve above the knee joint can vary,<sup>2</sup> which may explain the variable success rates reported for popliteal blocks. Despite the method used, it is necessary to ascertain the branch point of the SN and its relationship with nearby structures to ensure the success of a SN block. Although the popliteal crease is frequently used as a landmark in popliteal nerve blocks,<sup>3</sup> several factors can affect its utility. The popliteal crease is a skin fold formed by the movements of the knee, and its formation site is determined by the way the skin folds at the beginning of life. In addition, the crease can be difficult to locate in overweight individuals. Such differences can lead to block failure. Based on this difficulty, it has been suggested that a bony landmark, which can be easily determined and minimally affected by individual differences such as body weight, should be used to increase the chances for success. The transverse plane of the distal edge of the femoral condyles (FC) is one such bony landmark. The aim of this study was to determine the optimal distance from the distal edge of the FC for the needle to be placed during popliteal block, and to determine in detail how the SN branches into the tibial and common peroneal nerves in reference to this landmark.

This study was conducted in the Department of Anatomy, School of Medicine, Ankara University, Ankara, Turkey between June 2004 and April 2005. Twenty-eight (12 right and 16 left) lower extremities embalmed with 10% formalin were used in this study. Each leg was adjusted into the supine position with the long axis of the foot forming a 90° angle with the horizontal plane. Using “the transverse plane of the distal edge of the femoral condyles (FC)”, the “greater trochanter” (GT) and the “anterior superior iliac spine” (ASIS) as references, external measurements were taken of the distances between the GT-FC and the ASIS-FC using a digital caliper at a resolution of 0.01 mm

(BTS Digital Caliper 500×0.01 mm). The popliteal fossa and posterior aspect of each thigh was then carefully dissected (using a Zeiss OPMI 9-FC surgical microscope in some regions), and the branch points and patterns of the SN with reference to the landmarks were measured using a digital caliper at a resolution of 0.01 mm (BTS Digital Caliper 150×0.01 mm). We also measured the distances between “the level of division of the SN” (DSN) and the FC (DSN-FC) (Figure 1). The DSN-FC/GT-FC ratio was subsequently calculated to predict the separation site. Since the GT cannot be easily located in some individuals, we also calculated the DSN-FC/ASIS-FC ratio. Mean values and standard deviations were calculated for all cases.

The mean ASIS-FC length was 44.87±2.48 cm on the right side, and 43.86±3.13 cm on the left, whilst the mean GT-FC length was 31.84±2.06 cm on the right side, and 32.89±2.70 cm on the left. The SN divided at a mean distance of 6.85±2.59 cm on the right side, and 6.96±2.82 cm on the left above the transverse plane of the distal edge of the FC. The DSN-FC/ASIS-FC ratio was 0.14±0.04 on the right side, and 0.16±0.06 on the left. The DSN-FC/GT-FC ratio was 0.19±0.05 on the right side, and 0.21±0.08 on the left. In 2 cadavers, the distance from the DSN to the FC exceeded 12 cm.



**Figure 1** - The level of division of the left SN with reference to the FC. SN: sciatic nerve, TN: tibial nerve, CPN: common peroneal nerve, FC: transverse plane of the distal edge of the femoral condyles, CF: head of fibula, DSN: level of division of the SN.

Upper-level SN division and anatomical variations in the level at which the SN divides into the TN and CPN are possible causes of incomplete SN blocks during popliteal block anesthesia.<sup>4</sup> Branching of the SN may occur at a high level, and this anatomical fact must be kept in mind to ensure the success of popliteal block anesthesia. Vloka et al<sup>3</sup> reported that the SN divided at a mean distance of  $60.5 \pm 27$  mm (range 0-115 mm) above the popliteal fossa crease. As the popliteal crease can vary amongst individuals, using this site as a landmark is not sufficiently precise. Using the medial knee joint as their reference line, Schmeiser et al<sup>5</sup> reported that the SN showed a high degree of variation in its area of branching. This reference line, however, can be hard to detect. Therefore, the FC plane, which is a bony landmark, may be more reliable and easier to locate. Schmeiser et al<sup>5</sup> stated that no standard distribution existed for the bifurcation distance of the SN. Given that division of the SN can be 12 cm or more from the FC, insertion of the needle 13 cm above the FC may ensure placement of the needle at the proper site. Furthermore, measurement of the distance between the ASIS and FC may help determine the approximate termination point of the SN using the DSN-FC/ASIS-FC ratio.

We conclude that the SN divides into the TN and CPN at variable distances (a mean distance of  $6.92 \pm 2.67$  cm) from the FC. Insertion of the needle 13 cm above the FC may ensure placement at the proper site. This result has major implications for performing popliteal blocks and surgical interventions in the lower

extremities. The ratios described in this paper may help identify the termination level of the SN, allowing blocks to be performed more successfully.

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