

Cephalad Angulation of Epidural Needle Insertion May Be a Major Factor for Epidural Space Safe Approach: a Mathematical Model

Regarding the mathematical study of Inoue et al.¹, it is appropriate to mention the study by Cheng (Apud Collins)² published more than half a century ago in which the width of the circular epidural space (EP) and thickness of the dura mater (DM) were measured. According to Cheng², the axial width of EP at L2-L3 is 6 mm and if the puncture is 30 degrees to the skin, the puncture safety margin (Figure 1 A)¹ becomes 12 mm ($\text{sen } 30^\circ = 6 \text{ mm} / A$). In this line of thought, with a puncture angulation of 45 degrees, the safety margin (SM) of the EP will be 8.6 mm, which is smaller than the 30 degrees puncture. In the thoracic and cervical regions, EP decreases and the angulation of the median and paramedian punctures has that tendency as well due to the bony anatomy of the Spinal apophyses that guide the puncture angulation. Because

there is no data on the incidence of thoracic DM perforation, it is assumed that it is lower compared with the lumbar DM perforation. It is likely that many anesthesiologists, based on Euclidean reasoning, prefer the latter for the following reasons: 1) facilitate access to the EP; 2) result in greater SM (Figure 1)¹; 3) prevent DM perforation; 4) consume less time for blockade performance³; and 5) facilitate catheter introduction. This reasoning also applies in peripheral regional anesthesia^{4,5}, provided that a profound anatomical parameter is recognized, as shown in Figures 1 and 2.

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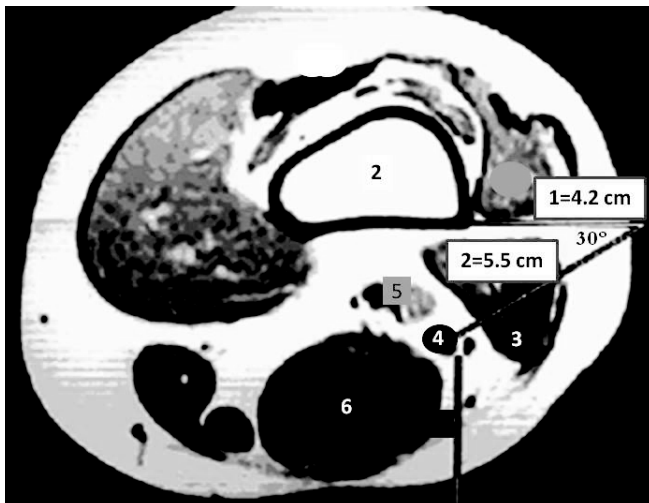


Figure 1. Ischiatic Blockade.

1: puncture 90° to the skin; 2: puncture 30° to the skin; 3: femoral biceps; 4: ischiatic nerve; 5: popliteal artery/vein; 6: semi-tendinous/semi-membrana (adapted) RB nº 4.

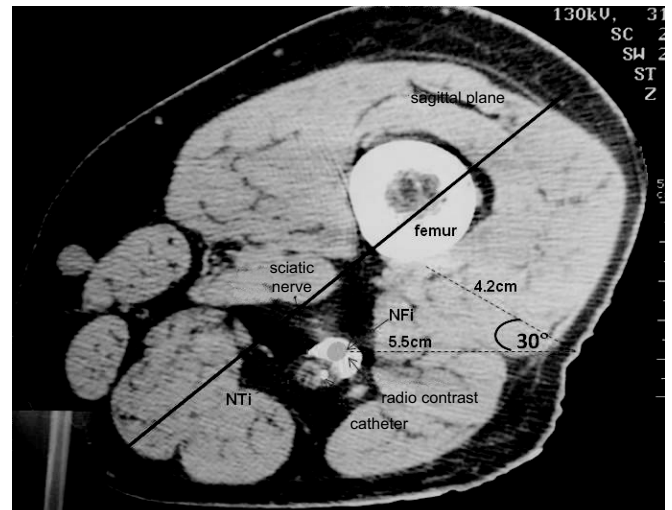


Figure 2. Member in External Rotation 47°. Ischiatic Blockade.

puncture 90° to the skin = 4.2 cm; puncture 30° to the skin = 5.5 cm; NFi: peroneal nerve; NTI: tibial nerve (adapted) RB nº 5.

REFERENCES

1. Inoue S, Kawaguchi M, Furuya H – Angulação cefálica da inserção da agulha peridural pode ser um fator importante para a abordagem segura do espaço peridural: um modelo matemático. *Rev Bras Anesthesiol*, 2011;61:6:767-769.
2. Collins VJ – Anestesia peridural. Em *Princípios de Anestesiologia*. 2ed. Rio de Janeiro: Guanabara Koogan, 1978, pp. 495-505.
3. Geier KO, Riffini SS, Ely PB – Thoracic epidural blockade in breast surgery outpatients. *Anais do Congresso da European Society of Regional Anesthesia (ESRA) 1997*. Londres (Poster).
4. Hadzic A, Vloka J D – A comparison of the posterior versus lateral approaches to the block of the sciatic nerve in the popliteal fossa. *Anesthesiology*, 1998;88:1480-1486.
5. Geier KO – Identificação tomográfica da bainha epineural dos nervos poplíteos durante anestesia regional intermitente do pé. *Relato de caso*. *Rev Bras Anesthesiol*, 2002;52:2 581-587.