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The True Epidural Space: Possible Consequences for Administered Material-based Drug Delivery Systems

To the Editor:—A recent paper by Hogan[1] showed that the epidural contents are found in repeating metameric segmentation in the longitudinal axis of the spinal canal. This finding could explain the distribution of a 10% n-butyl-p-aminobenzoate (BAB) suspension injected epidurally,[2] found at necropsy 36 days after its administration (fig. 1). The distribution of profound analgesia after epidural BAB administration corresponded well with the distribution of BAB along the segmental spinal nerve roots found at necropsy. The concept of epidural segmented subcompartments is important not only for understanding the mechanics and pharmacokinetics of solutions injected into the epidural space, but also for understanding how material-based drug delivery systems, such as a 10% BAB suspension, distributes into the epidural space. That the lateral epidural subcompartment is in close contact with the spinal nerve roots is of particular importance. Moreover, the various epidural subcompartments do not seem to communicate. This new anatomic insight may explain variability in responses seen after epidural injection of a 10% BAB suspension.[2]

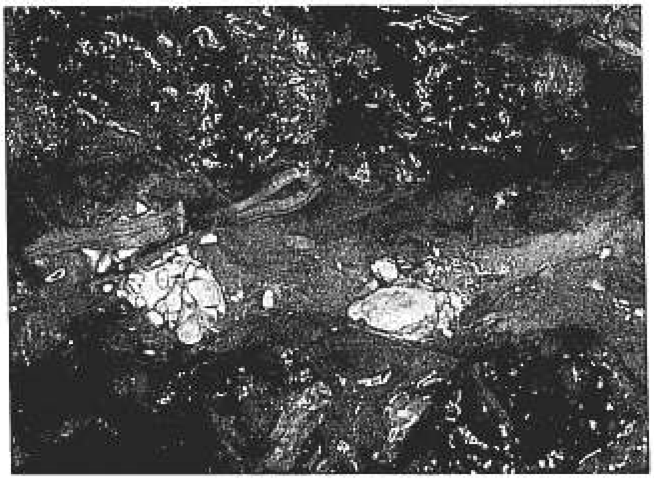

FIG. 1. Epidural dorsal subcompartment seen from the front, after removal of vertebral bodies, dural sac, and spinal roots. Thirty-six days after its epidural administration, BAB is found in repeating metamerical regions in the dorsolateral epidural subcompartments.

Advances in materials science and biotechnology are permitting the development of new material-based drug delivery systems,[3] already in use in medicine. Continued research may revolutionize the way drugs, including those intended for epidural administration, are delivered. Material-based drug delivery systems have many potential advantages, which include 1) maintenance of the drug in the desired therapeutic range by a single epidural administration; 2) less risk for general toxic reactions; 3) preservation of drugs that are rapidly destroyed by the body; 4) less need for follow-up care; 5) increased comfort; and 6) improved compliance.[3] In light of these pharmaceutical developments, the new knowledge of the anatomy of the epidural space is of particular importance.

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REFERENCES

1. Hogan QH: Lumbar epidural anatomy. A new look by cryomicrotome section. ANESTHESIOLOGY 75:767–775, 1991
2. Korsten HHM, Ackerman EW, Grouls RE, van Zundert AAJ, Boon WF, Bal F, Crommelin MA, Ribot JG, Hoefsloot F, Slooff JL: Long-lasting epidural sensory blockade by n-butyl-p-aminobenzoate in the terminally ill intractable cancer pain patient. ANESTHESIOLOGY 75:950–960, 1991
3. Langer R: New methods of drug delivery. Science 249:1527–1533, 1990

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In Reply:—In considering the interesting observation by Korsten *et al.* of the segmental distribution of particulate matter in the epidural space, a distinction should be made between the location of natural epidural contents and the spread of injected material. The contents occur in segmented packets that are not in continuity with each other circumferentially or longitudinally. However, when observed by cryomicrotome section in cadavers or by computerized tomography *in vivo* (unreported results), injected solutions typically spread continuously in a sheetlike fashion, occupying without gaps the areas between the dura, canal wall, and epidural fat (fig. 1) because these tissues are mostly nonadherent to each other. The compartments must communicate (*i.e.*, allow passage between them) or solution would not spread and a catheter would not advance. Fortunately, nature has provided us with separable tissue planes.

Although epidurography[1–3] and radionuclide studies[4,5] proved that the distribution of injected solution is not discontinuous or interrupted, Nishimura (personal communication) showed that it is not longitudinally uniform, which may be due to the greater distensibility of the epidural