Title : THE INFLUENCE OF HEIGHT ON EPIDURAL SPREAD IN YOUNG AND OLD PATIENTS

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Introduction. Knowing the factors which cause considerable variations in anesthetic levels following lumbar epidural blockade could make epidural anesthesia safer and more acceptable. Height or more directly length of the epidural space may influence epidural spread, but studies have not verified this.[1,2] The observations of Burns[2] may be inapplicable as the limits of spread of radioopaque dye do not always correspond to areas anesthetized. Furthermore, Bromage neither injected a standard volume nor studied separate age groups.[1]

To assess the influence of height and the length of the epidural space on the spread of local anesthetic injected into the lumbar epidural space measurements were made on 29 patients aged 60-80, and 28 aged 20-40. Younger and older patients were analysed separately as epidural dose responses vary with age.[3]

Methods. Height was measured on admission to the hospital and the distance from the coccyx to the external occipital protuberance measured (considered to closely reflect the limits of epidural space) with the patient positioned for the insertion of the epidural needle. Epidural puncture was performed in the lateral decubitus via a midline approach at the L2-3 interspace using an airfilled syringe for the detection of loss of resistance. Injections of 0.75% bupivacaine with freshly added epinephrine to a concentration of 1:200,000 was made at a rate of 1 ml per second. All patients aged 60-80 received 10 ml and those aged 20-40, 25 ml of 0.75% bupivacaine which included a 2 ml test dose. A catheter was then inserted, the needle withdrawn and the patient turned to the supine position. Thirty minutes after injection anesthetic levels were determined by absence of pain to pinprick when counting upward from the fifth sacral segment. Informed consent and institutional approval for the study were obtained.

Results. In patients aged 60-80 both the length of the epidural space and patient's height correlated significantly with the number of spinal segments anesthetized ($r=0.51$ $p<0.01$ and $r=0.53$ $p<0.01$ respectively). Fig 1 and 2. In contrast, there was no significant correlation observed between either variable in patients aged 20-40. Fig 3 and 4. ($r=0.13$ NS and $r=0.21$ NS respectively). Patients aged 60-80 who are 5 feet 4 inches or less had 18.9± 1.6 S.D. segments anesthetized whereas those 5 feet 9 inches or more had 16.4± 1.7 S.D. segments blocked. ($p<0.01$)

Discussion. Height effects the extent of epidural anesthesia in the elderly but has no influence in younger individuals. The difference between the effect of height in young and old patients suggests that either the site of action is different, or that pattern of spread is under different influences in the two age groups. The spread of anesthetic is influenced by the relative patency of the intervertebral foramena. Radiographs of the back following injection of radioopaque dye into the epidural space demonstrate free passage of dye into the paravertebral space in the young whereas in elderly individuals the dye extends more caphalad as it is retained within the epidural space. On the other hand this difference may reflect a different site of action being predominantly spinal cord in the elderly with more nerve root effect in the young.

Height is an influence on the extent of epidural anesthesia in the elderly but cannot be used as the sole predictor of anesthetic levels. Other variables such as obesity, permiability of the dura or compliance of the epidrual space also influence spread and contributed to the variation observed. In the young patient height is of no value in predicting anesthetic levels. Estimating the dose to inject by measuring the length of the back offers no advantage over patient height and is not recommended for clinical use.

Fig. 1

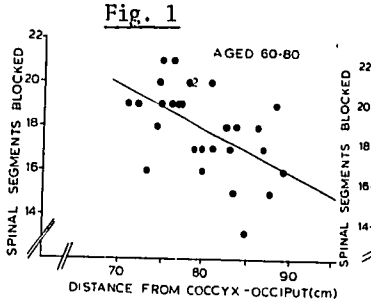
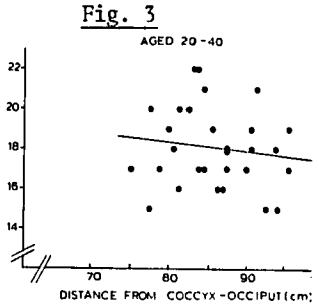


Fig. 3



Correlation between spinal segments anesthetized and the length of the epidural space in patients aged 60 to 80 ($y=-0.47x+32.9$): 20 to 40 ($y=-0.11x+21.8$).

Fig. 2

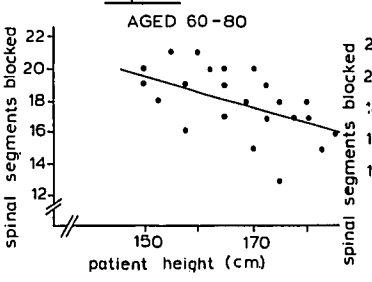
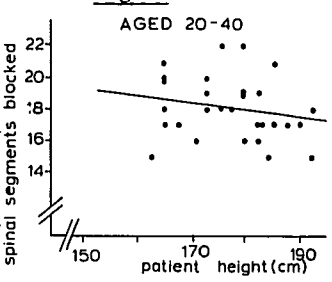


Fig. 4



Correlation between spinal segments anesthetized and patient height in patients aged 60 to 80 ($y=-0.24x+33.8$): 20 to 40 ($y=-0.12x+26.6$).

References.

1. Bromage PR: Spread of analgesic solutions in the epidural space and their site of action: a statistical study. Brit J Anaesth 34:161-177, 1962.
2. Burn JM, Guyer PB, Langdon L: Spread of solutions injected into the epidural space. Brit J Anaesth 45: 338-344, 1973.
3. Sharrock NE: Epidural anesthetic dose responses in patients aged 20 to 80 years old. Anesthesiology 49:425-428, 1978.