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Short communications

Anatomical considerations of endothoracic dwelling catheter

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We previously reported a case of catheter placement in the endothoracic fascia. Repreated administration through the catheter resulted in steady unilateral anesthesia. To investigate this anesthetic mechanism, we investigated how the anesthetic agent spread in the fascia of two cadavers. We found that the endothoracic fascia is so loose that dye injected in the cadavers spread both longitudinally and laterally in the paravertebral region.

In the case of catheter placement in the endothoracic fascia we previously reported [1,2], a 22-year-old woman was brought to the operating room for an appendectomy. We elected to proceed with epidural anesthesia for this surgical operation.

With the patient in the lateral position, a 17-G Tuohy needle was inserted at the T11-12 interspace through the paramedian approach. The skin was punctured 3 cm lateral from the median line. We found a loss of resistance-to-saline when the needle was inserted about 8 cm. A 20-G open-tip Teflon epidural catheter (Abbott, North Chicago, IL, USA) was threaded through the needle. The catheter tip was 4 cm left in what was originally presumed to be epidural space. No blood or other fluid could be aspirated through the catheter. Twelve ml of 2% mepivacaine was administered through this catheter. The analgesic examination 10 min after the deposition showed left hemiparesis from T4 to L3. A subsequent X-ray and computed tomography (CT) scan were performed which revealed that the catheter tip was inserted in the endothoracic fascia.

This anesthesia was unique for the following reasons: (1) The catheter was placed in the endothoracic fascia, (2) an obvious loss of resistance was found while the Tuohy needle was advanced, (3) the catheter was inserted easily, and (4) we obtained a broad range of analgesia unilaterally. The unilaterality is perhaps the most interesting part of this procedure.

To investigate the anesthetic mechanism, we studied how the anesthetic agent spread in the fascia of two cadavers. The chests were opened, and the hearts and lungs were removed. With the cadavers in the lateral position as in the clinical report, the Tuohy needle was inserted in the same fashion. Four milliliters of red dye were injected through a Tuohy needle at the same place as the anesthetic agent and the saline. The dye could be injected easily when a loss-of-resistance was perceived. The needle tip was found to have attained the region just under the parietal pleura. The depth of the region is unknown so far.

Figure 1 shows the spreading of the red dye under the parietal pleura. The parietal pleura was easily detached from the fascia because the tissue was loose. The intercostal nerves, the sympathetic trunk and splanchnic nerves were in close proximity (Fig. 2).

Figure 3 shows a schematic view of the endothoracic fascia and the method of needle insertion. This insertion method seems to resemble the paralaminar method described by Bonica [3] to perform paravertebral block. He perceived a loss of resistance when the tip of the needle reached the radix in the intercostal nerve. However, he did not describe broad unilateral anesthesia. In our case, the needle tip reached the lateral or anterior face of the vertebral body instead of the region of the nerve radix.

The endothoracic fascia is a thick tissue which binds the parietal pleura to the vertebral bones, the ribs, and the intercostal muscles [4,5]. It spreads from the pharyn-

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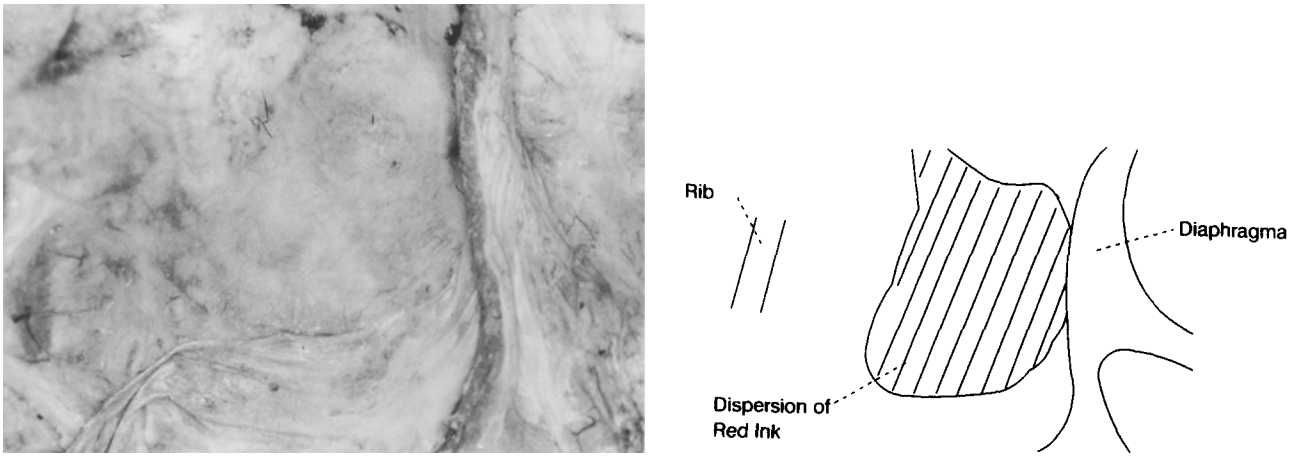

Fig. 1. Spreading of the 4-ml red dye in the endothoracic fascia under the pleura. Diaphragm is cut near the origin to show the spreading. The liver is also removed from the abdominal cavity (*right*). Frontal region of vertebral bodies on the *top*

Fig. 2. Parietal pleura is detached. Endothoracic fascia consists of fibers and fat. Nerve routes are seen in this region

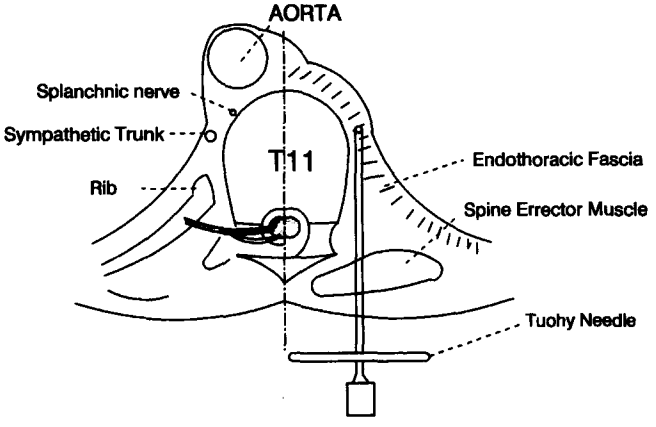

Fig. 3. Schematic view of the position and anatomy around the endothoracic fascia with the insertion of Tuohy needle. The needle tip reaches lateral face of the vertebral body

geal tubercle of the basis cranii down to the crus diaphragmaticus at the frontal face of L3. The tissue does not seem to be uniform. There seem to be several fibrous layers, and we were unable to identify into which part the catheter tip was inserted. We presume there is some layer through which the anesthetic drug easily spreads. As shown in Fig. 2, we found that fluids can spread in the endothoracic fascia in the chest cavity. However, the upper and lower limit of the drug dispersion remains to be explored. The cessation of the endothoracic fascia at the level of L3 may prevent drug dispersion to this point beyond this level.

There are reports which suggest that epidural anesthesia impairs adrenergic vasomotor control [6,7]. The physiological cardiac vascular response to hypoxemia and hypotension is abolished in thoracic epidural anesthesia. Epidural anesthesia also decreases the body temperature to a greater extent with advancing age [8]. Unilateral anesthesia on the other hand is expected to produce a more natural sympathetic condition.

This anesthesia, with luck, may contribute to a new anesthetic approach for high-risk surgical operations.

References

1. Saito T, Yamada K, Tanuma K, et al. (to be published) Dwelling Catheter in Endothoracic Fascia. Anesthesiology
2. Saito T, Yamada K, Ogawa R, et al. (1993) A case report of catheter insertion in endothoracic fascia. J Clin Anesth (in Japanese) 17:1251–1252
3. Bonica JJ (1989) Block of thoracic spinal nerves. In: Wall PD, Melzack R (eds) Textbook of pain, 2nd edn. Edinburgh, p 734
4. Pernkopf E (1980) Atlas der topographischen und angewandten Anatomie des Menschen. München, Urban Schwarzenberg, pp 142–256

5. Kubik S (1968) Colour atlas of topographic anatomy with clinical aspect, vol 3. Thorax. Thieme, Stuttgart, pp 54–57
6. Peters J, Kutkuhn B, Medert HA, et al. (1990) Sympathetic blockade by epidural anesthesia attenuates the cardiovascular respone to severe hypoxemia. Anesthesiology 72:134–144
7. Saada M, Duval AM, Bonnet F, et al. (1989) Abnormalities in myocardial segmental wall motion during lumbar epidural anesthesia. Anesthesiology 71:26–32
8. Frank SM, Beattie C, Christopherson R, et al. (1992) Epidural versus general anesthesia, ambient operating room temperature, and patient age as predictors of inadvertent hypothermia. Anesthesiology 77:252–257