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SHORT COMMUNICATIONS

Intrapartum epidural catheter migration: a comparative study of three dressing applications

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We compared three types of catheter fixation application for their ability to minimize the incidence and magnitude of epidural catheter movement during labour. Patients were randomized to have their epidural catheter secured by a Tegaderm dressing (group T; *n*=35), a Tegaderm dressing plus filter-shoulder fixation (group F; *n*=39), or a Niko Epi-Fix dressing (group *N*; *n*=37). The length of catheter visible at the patient's skin surface was recorded (to the nearest 0.5 cm) after insertion and before removal; the difference was defined as 'catheter movement'. Outward movement of the catheter was greatest when a Niko Epi-Fix was used ($P<0.01$). Concerning minimization of displacement of the epidural catheter *per se*, only a Tegaderm dressing with additional filter-shoulder fixation proved more effective than using a Niko Epi-Fix dressing ($P<0.05$).

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Once an epidural catheter has been safely inserted, it may still migrate appreciably despite efforts to secure it at the skin surface.[1] Such movement of the epidural catheter may induce complications many hours after insertion. Unintentional intravenous injection of local anaesthetic[2] and total spinal anaesthesia[3] have been reported during labour and attributed to catheter migration. A 'mobile' epidural catheter may enter the subdural space,[4] generating potentially dangerous effects. The catheter can exit the epidural space via an inter-vertebral foramen[5] giving rise to a patchy or unilateral block. Alternatively, it may retract into the soft tissues of the back, resulting in failure of analgesia. Movement of the catheter at the skin surface does not translate to migration of the catheter tip, but does suggest that it may have become displaced. Notable migration of the epidural catheter at the skin surface has been observed to occur in >40% of parturients.[6] We conducted a randomized controlled trial comparing three types of catheter fixation application for their ability to minimize the incidence and magnitude of epidural catheter migration during labour.

Methods and results

After obtaining approval from the Regional Ethics Committee, 135 women requesting epidural analgesia during labour were invited to participate and written informed consent was obtained from each.

The epidural catheter was inserted using an 'Epidural minipack' kit (SIMS Portex Ltd, Hythe, UK), with the patient in the sitting position. After identifying the epidural space by loss of resistance to 0.9% saline, a 16G Portex epidural catheter was inserted, leaving 4 cm within the space. The remainder of the catheter was directed longitudinally up the patient's back in the midline, over their left shoulder and the in-line filter was attached. Once inserted, one of following three dressing methods was randomly allocated using a sealed envelope technique in order to secure the catheter. In group T, a 10×25 cm Tegaderm dressing (3M Health Care, St Paul, MN, USA) was applied over a single redundant loop of catheter. In group F, the catheter was secured exactly as in group T, but in addition, the in-line epidural filter was fixed to the skin of the left shoulder by Mefix (Molnycke Health Care AB, Goteborg, Sweden). In group N, a Niko Epi-Fix dressing (Niko Surgical Ltd, Stonehouse, UK) was applied to the site of catheter insertion. The design of this fixative allows no redundant loop of catheter. Lengths of 10 cm width Mefix were applied to all of the borders of the respective Tegaderm and Niko Epi-Fix dressings. A length of 5 cm

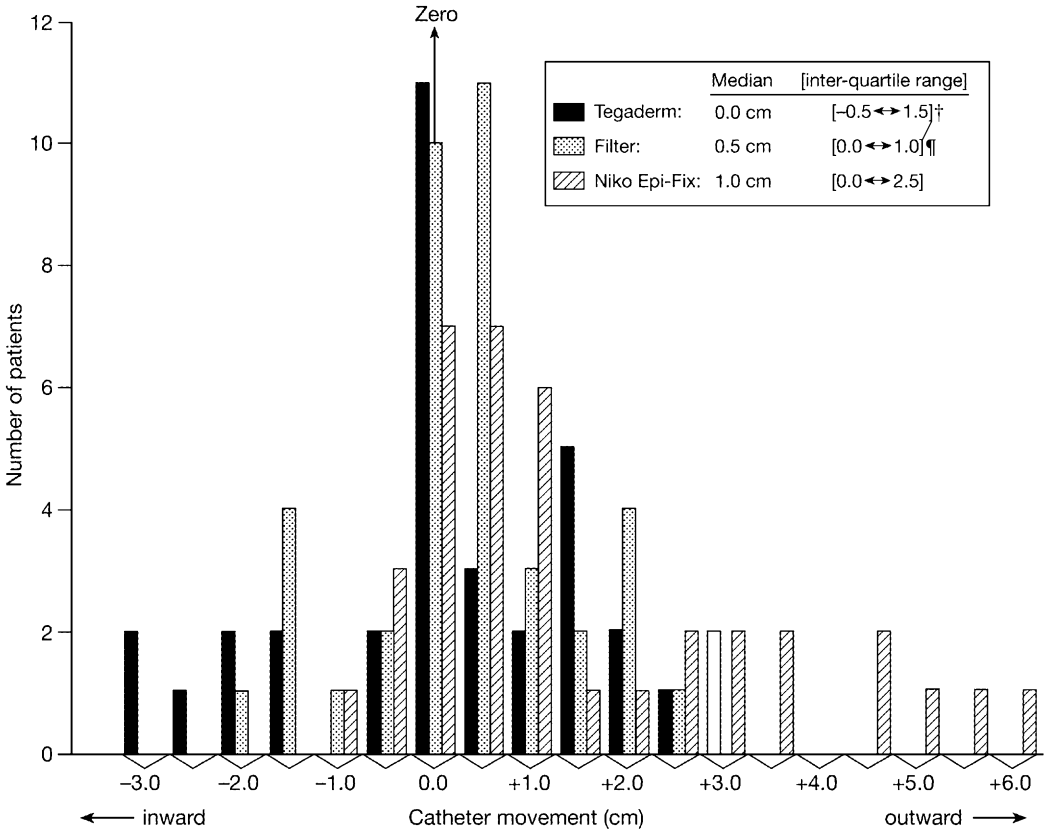

Fig 1 Histogram showing directional catheter movement classified by type of dressing. †Significantly different from Niko Epi-Fix (P<0.01); ¶significantly different from Niko Epi-Fix (P<0.01).

width Mefix was applied over the exposed catheter, from the upper border of the respective dressing superiorly along the patient's back. The in-line filter was connected to a Graseby 9300 infusion pump (Graseby Medical Ltd, Watford, UK) via an extension set. Epidural analgesia was effected by continuous infusion (10–15 ml h^{-1}) of 0.1% bupivacaine and 0.001% alfentanil. Patients did not ambulate during labour, but were allowed to adopt either sitting or lateral positions.

Following dressing application, the patient characteristics were recorded and the time was noted. The inter-vertebral space at which the epidural was sited, the use of a skin incision, the distance between the skin and the epidural space (cm), and the length of catheter visible at the skin surface (to the nearest 0.5 cm) were also recorded.

One hour after delivery, immediately before removing the epidural catheter, the time was noted, allowing the duration of the catheter's presence to be calculated. Also recorded were the integrity of the dressing, whether any analgesia problems had been encountered and the length of catheter visible at the skin surface (to the nearest 0.5 cm).

The initial catheter reading minus the final measurement was defined as the catheter movement. Two aspects of catheter movement were considered. The first follows a convention adopted by previous workers,[2] in which movement of the catheter can occur in a outward (+) or inward (–) direction, and was defined as 'directional' movement (MOV_D). The second addresses only the magnitude of catheter displacement, irrespective of direction, and was defined as 'absolute' movement (MOV_A).

Based on previous data,[1] 35 patients per group were required to detect an inter-group difference of 0.5 cm (α 0.05, β 0.9). Data were analysed using analysis of variance and Dunnnett's *post hoc* test, Student's *t*-test, χ^2 analysis and Pearson's correlation coefficients where appropriate (SPSS v.9.0).

Of the 135 patients recruited, 24 were not completely assessed because of progression to emergency Caesarean section. Of the remaining 111 patients, 35 were in group T, 39 in group F and 37 in group N. Six patients who experienced complete failure of analgesia with no demonstrable sensory block had final observations recorded and their epidural catheter resited. Five of these patients were in group N and one in group T (P<0.05; χ^2). There were no differences in patient characteristics, duration of catheter presence (P>0.05; analysis of variance) or final dressing integrity (P>0.05; χ^2) between groups. The use of a blade for skin incision, or choosing a different inter-vertebral space did not influence MOV_D or MOV_A (P>0.05; Student's *t*-test). There was no significant correlation between duration of catheter presence and MOV_D or MOV_A.

No movement of the epidural catheter was observed in 28 patients, whilst inward movement was seen in 21 and outward in 62. Directional catheter movement (MOV_D) for

the three dressing groups is shown in Figure 1, with associated values for median and inter-quartile range. Patients in groups T and F had less 'directional' movement than those in group N ($P<0.01$: analysis of variance). Only patients in group F displayed less MOV_A than those in group N ($P<0.05$: analysis of variance).

In patients in group F, MOV_A of the epidural catheter tended to be higher in those of greater body mass index ($R=0.27$; $P<0.01$). No significant correlation was identified between MOV_A (groups T and N), or MOV_D (any dressing group), and the patient's body mass index.

Comment

The ideal method of fixing catheters would encompass optimal security of the catheter, ease of inspection and maintenance of sterility at the site of insertion. Not only must an application function in dry conditions, but it must retain this efficacy after exposure to blood, perspiration and epidural solution. Placement of a Tegaderm over a loop of catheter (group T) is the routine method of catheter fixation in our hospital. Fixation of a particulate filter (group F) was undertaken to examine whether this stabilized the catheter further. The Niko Epi-Fix (used in group N) is a fixation device that has been introduced recently, specifically for securing an epidural catheter. The cost of this device is comparable to that of the Tegaderm dressing (£1.50 and £1.24 respectively; September 2000).

Outward movement of the epidural catheter was greatest when a Niko Epi-Fix dressing was used to secure the catheter, and was associated with significantly more failures in analgesia. However, when attempting to minimize movement of the catheter irrespective of direction, only the Tegaderm dressing with additional filter fixation confers a significant advantage over the Niko Epi-Fix.

We identified no correlation between epidural catheter movement and the duration of catheter presence, a finding in concordance with earlier work.[6] Additionally, we showed that neither the use of a small skin incision at the site of catheter insertion, nor the selected inter-vertebral level affected movement of the epidural catheter. A previous study[1] demonstrated that body mass index is related to amount of catheter movement. Our data confirmed this association in group F but was unable to show this in the remainder of the patients, perhaps because inadequate numbers of people were studied.

References

1 Bishton IM, Martin PH, Vernon JM, Liu WHD. Factors influencing epidural catheter migration. *Anaesthesia* 1992; **47**: 610–2

2 Ravindram R, Albrecht W, McKay M. Apparent intravascular migration of epidural catheter. *Anesth Analg* 1979; **58**: 252–3

3 Philip JH, Brown WU. Total spinal anesthesia late in the course of obstetric bupivacaine epidural block. *Anesthesiology* 1976; **44**: 340–1

4 Abouleish E, Goldstein M. Migration of an extradural catheter into the subdural space. *Br J Anaesth* 1986; **58**: 1194–7

5 Hogan Q. Epidural catheter tip position and distribution of injectate evaluated by computed tomography. *Anesthesiology* 1999; **90**: 964–70

6 Phillips DC, Macdonald R. Epidural catheter migration during labour. *Anaesthesia* 1987; **42**: 661–3