

A new method for epidural catheter fixation

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ÖZET

Epidural kateter tespiti için yeni bir metot

Bu çalışmada, intravenöz sıvı torbasının ilaç portu kullanılarak yapılan bir epidural kateter tespitleyicinin kateter göçü üzerindeki etkisi araştırılmıştır. Çalışmaya alınan ve epidural analjezi planlanan 50 hasta 2 gruba ayrıldı. Yeni tespitleyici grubunda (n=25) epidural kateter, yeni fiksatorün içinden geçirilerek, yapışkanlı örtü ile sabitlendi, standart pansuman grubunda ise (n=25) sadece yapışkanlı örtü ile tespit edildi. Dışarıya 2 cm'den fazla, içeriye 1 cm'den fazla kateter göçü, tespit başarısızlığı olarak tanımlandı. Takip süresi sonunda kateterin içeriye veya dışarıya göç uzunluğu ve kateterin çekilme gerekçesi kaydedildi. Dışarıya kateter göçü standart pansuman grubunda 7 hastada, yeni tespitleyici grubunda 2 hastada bulundu ($p>0.05$). İçeriye kateter göçü sadece standart pansuman grubunda 5 hastada belirlendi ($p<0.05$). Standart pansuman grubunda 13, yeni fiksator grubunda 23 hastada, kateterde hareket olmadığı görüldü ($p<0.05$). Standart pansuman grubunda, en sık kateter çekilme sebebi, kateter göçü idi. Yeni tespitleyici grubunda ise kateterler tedavinin sonlanmasının ardından çekildi. Yeni tarif edilen tespit metodunun, kısa vadeli kullanımda epidural kateter göçünün azaltılmasında etkin bir metot olduğu sonucuna ulaşıldı.

Anahtar kelimeler: Epidural, kateter, tespit

SUMMARY

We investigated the effect of a new fixator made from a medication port of a intravenous fluid container on the migration of epidural catheter. Fifty patients were recruited to receive epidural analgesia and allocated to one of two groups. In the new fixator group (n=25) epidural catheter was advanced through a fixator then fixed with transparent adhesive dressing, in the standard dressing group (n=25), the catheter was fixed only with transparent adhesive dressing. Outward migration of the catheter over 2 cm, and inward migration over 1 cm was described as the failure of the fixation. At the end of the follow up time, outward migration or inward migration distance, and the reason for removing the catheter were recorded. In the standard dressing group, outward migration was detected in 7 patients compared to 2 patients in the new fixator group ($p>0.05$). Inward migration was determined in only 5 cases in the standard dressing group ($p<0.05$). There was no movement in 13 cases in the standard dressing group compared with 23 of the new fixator group ($p<0.05$). The main reason for removal in the standard dressing group was the migration of the catheter whereas the catheter was removed on a regular basis at the end of therapy in the new fixator group. We concluded that the newly described fixation method for epidural catheter is an effective method in reducing catheter migration for short term usage.

Key words: Epidural, catheter, fixation

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Introduction

The displacement and migration of the epidural catheter is a commonly seen equipment failure which may cause inadequate epidural analgesia (Ballantyne et al. 2003). It was suggested that the frequent changes of posture for physiotherapy, diagnostic scanning and early mobility may increase the chances of epidural catheter dislodgement in the immediate postoperative period (Tripathi and Pandey 2000). Migration of the catheter carries potentially risk for patients such as analgesic failure, inadvertent spinal block, local anesthetic toxicity. Especially analgesic failure means that the catheter placement does not provide continuous and long term analgesia postoperatively contradictory to the insertion aim (Tripathi and Pandey 2000).

Numerous fixation methods were suggested in the literature to avoid these complications. An ideal method of fixing catheters should be safe, non invasive, cost effective (Clark et al. 2001) and provide security and sterility of the catheter, ease of inspection, efficacy after exposure to blood and perspiration (Burns et al. 2001). Currently epidural catheters have been fixated through standard dressing (Burns et al. 2001), tunnelling (Tripathi and Pandey 2000), Lockit clamp (Clark et al. 2001). A special balloon tipped catheter (Goltzer D, 1990 US Patent no: 497305) was also designed but it is not commercially available.

Flexible intravenous (iv) containers, which are commonly referred to as "intravenous bags," are used to help administer medications and solutions to patients. The medication port is described where the care giver injects the medication into the container. We developed a catheter fixator based on a soft tube obtained from the medication port of a flexible intravenous container. In this paper we aimed to compare the new fixation method with standard dressing for epidural catheter fixation.

Material and Method

After obtaining the approval of the hospital ethics committee and the informed consent from the patients, 50 patients were recruited for the study aged of 18-70 yrs, ASA I-III, scheduled orthopedic or urologic surgery under epidural or combined spinal epidural anesthesia.

After interned into the operating room, an epidural catheter was inserted with a Minipack (SIMS Portex Ltd, Hythe, UK) at the lumbar region with

midline approach. The epidural pack includes a catheter marked at 1cm intervals up to 20 cm which noted and used as the indicator of the migration. In all patients the catheter length in the epidural space was kept 3 cm to avoid catheter knotting (Gozal et al. 1996). The correct placement of epidural catheter in epidural space was not confirmed by means of imaging methods. After catheter insertion patients were randomly allocated to one of the following groups by opening the sealed envelope;

1. Standard Dressing Group (n=25): The coiled catheter is left under a 6x7 cm adhesive transparent dressing (Opsite, Smith Nephew Medical Ltd.,Hull, UK) after the patient deflexed. Finally the frame of the dressing and the rest of the catheter tape (Hypafix) along the back of the patient.

2. Fixator Group (n=25): Following the catheter placement a fixator is prepared in a sterile manner. The medication port of a flexible intravenous bag (Mediflex, Eczacıbaşı-Baxter, Turkey) is used for this purpose. The medication port is cut to be 1 cm in length distally (fig 1 a). The external transparent and stiff cover (produced by polyvinile chloride) is removed (fig 1 b). Therefore two tubes inserted into each other are obtained (fig 1 c). Then the part of soft and dark yellow 'stopper' is retracted and used to obtain a fixator. It is extended to take its final form as a tube of different diameters at both ends and filled in the middle section. The Tuohy needle is advanced through into this soft tube. The distal end of the epidural catheter is fed into bevel of the Tuohy needle (fig 1 d) and pulled through the soft tube. When the Tuohy needle is removed, the catheter is placed at the center of the tube horizontally. The final step is to cut the tube at both ends to enhance the surface of the fixator and to obtain four wings.

The recorded data were as follows: Demographic variabilities (age, sex), the depth of epidural catheter at time of insertion and removal, the day and the reason for catheter removing. The migration to outward over 2 cm or the migration to inward over 1 cm was accepted as the failure of the fixation method. The comfort and feelings of patients about the new fixation apparatus was noted also.

Student's t-test and Chi-square test were used to assess the statistical analyse of the data. A calculated value of $p < 0.05$ was accepted as statistically significant.

Table 1. The catheter duration and migration incidences in groups.

	Standard Group (n=25)	Fixator Group (n=25)	<i>p</i>
Catheter duration (day)	2.5 ±1.3	3.0 ±0.1	>0.05
Outward migration (n)	7	2	>0.05
Inward migration (n)	5	0	<0.05
No movement (n)	13	23	<0.05

Results

The male/female ratio was 15/10 in the new fixator group and 13/12 in the standard dressing group ($p>0.05$) and the mean age was 52 ± 4 yr and 56 ± 3 yr in groups respectively ($p>0.05$). There was no difference between two groups in regard to insertion site and depth of epidural space ($p>0.05$). The duration of catheter use was 3.0 ± 0.1 days in the fixator group, 2.5 ± 1.3 days in the standard group (Table 1) ($p>0.05$). In the new fixator group outward catheter migration was found in 2 patient and 7 patients in the standard dressing group (Table 1) ($p>0.05$). Significant inward migration was observed in 5 patients of the standard group and in none in the new fixator group (Table 1) ($p<0.05$). No significant movement occurred in 23 patients compared with 13 in the standard dressing group ($p<0.05$). Local inflammation was seen in no patient.

The main reason determined for removing catheter in groups was the migration in the standard dressing group, and no need to epidural analgesia in the new fixator group. Local inflammation signs were observed in none of the patients.

The patients questioned about the comfort of new fixator and expressed that they did not feel something strange at the back where the new fixator was used.

Discussion

Epidural catheter is a fine material having the risk of being easily stretched or snapped if it becomes entangled (Royse et al. 2006). There are numerous epidural catheter fixation methods reported in

the literature for tethering the catheter to the skin; different types of dressing (Burns et al. 2001), adhesive foam (Day and Graham 2002), subcutaneous tunnelling with a loop (Tripathi and Pandey 2000), catheter clamps (Lockit®, Portex, UK) (Clark et al. 2001).

It was reported that commonly used method of coiling the catheter under a transparent dressing is not associated with catheter migration (Duffy 1981). But this finding is not compatible with two other studies in which the incidence was reported with this method as 16% (Clark et al. 2001) and 36% (Bishton et al. 1992). The looping of catheter was suggested to decrease the migration (Tripathi and Pandey 2000) but it should be borne in mind that the catheter is vulnerable to stretch even with a loop.

The direction of the catheter migration designates the outcome of complication. Inward migration may cause serious complications such as spinal block and intravascular infusion (Gartrell 1992) whereas analgesic failure frequently associated with outward migration (Tripathi and Pandey 2000). Clark et al. (2001) suggested that, though migration was markedly towards outside due to patient's movements Lockit® device prevents inward migration effectively. In contrast to this report, Phillips and Macdonald (1987) showed that epidural catheters migrated inward twice as common as in obstetric population. In the present study we showed that the new fixator is effective in preventing inward migration significantly. Without statistical significance the incidence of outward migration was lower in the fixator group compared with the standard dressing group (8% vs 28% respectively). The probable reason for this

Table 2. The reasons for terminating the epidural catheter.

Reason	Standard group (n=25)	Fixator group (n=25)
Catheter migration	12	2
Inadequate analgesia	1	2
No need for analgesia	10	18
Patients' request	2	3



Fig 1. The preparation of epidural fixator.

effect may be explained as that the fixator does not slip on the catheter easily making a barrier at the puncture zone for inward migration. While the catheter is stretched or rubbed by external movements of the patient especially, the soft fixator material is flattened and embedded in the skin (when pressed the maximal height of the fixator is 1.5 mm). This application may diminish the protuberance partially.

Clark et al. (2001) reported that it may be difficult to document the reason for analgesic failure when faced with an inadequate epidural. In a recent study (Motamed et al. 2006) which examined postoperative epidural analgesia failure by computed tomography epidurography, it was found that the major factor in epidural analgesia was dislodgement of the catheter. The successful epidural analgesia was found always associated with the epidural catheter placed in epidural space appropriately with/or without solution leakage. In the present study we did not direct the tip of the catheter and accepted the epidural analgesia success as the clinical indicator of the catheter position in the epidural space not taking into consideration the other causes of failure. If the catheter is left at 3 cm left in epidural space the mentioned hypothesis may be true. We left the catheter in the epidural space 3 cm in length, so the significant (over 2 cm) outward migration may mean analgesic failure. As a matter of fact, similar rates of the outward migration and the analgesic failure support this comment. In the study of Clark et al. (2001), the length of catheter left in the epidural space was reported approximately 5 cm. It may be interpreted that, even following the significant outward migration, a part of catheter with holes in the epidural space provide fluid influx.

Lockit® catheter clamp has been designed as a special device for catheter fixation. It was reported to be very effective at preventing both inward and outward migration of epidural catheters (Day and Graham 2002, Clark et al. 2001). But this method may cause two drawbacks; firstly the problem of discomfort arise from the stiff clamp material which may lead even to the removal of the catheter (Clark et al. 2001). To reduce the discomfort, it was suggested to use paramedian approach in which Lockit® clamp was placed away from the prominent spinous process. Secondly, the problem related to protuberant nature of the clamp device tended to pierce the dressing thus exposing the epidural catheter (Day and Graham 2002). Clark et al. (2001) reported the holes in the Opsite dressing due to stiff nature was the cause of the catheter removal. Day and Graham (2002) suggested to use Lyofoam dressings for providing extra stability and padding to the clamp as well as reducing the risk of catheter damage and exposure. Additionally its cost and availability limit suitability and the preference of the Lockit® commonly. In the present study the material which we used is soft in nature thus providing comfort for patients and endurance for dressings. The presented material is cost effective (the cost of an 100 cc intravenous bag is 1 Euro in our pharmacy) also.

Adhesive techniques of catheter fixation carry a risk of reduction to adhesion over time (Poulton and Young 2000), so they are not optimally suitable. The concurrent use of plastic adhesive spray (Coupe and al-Shaikh 1999) or wet conditions under the surface of the adhesive drapes may cause ineffective adhesion to the skin. As a precaution, the dressing should be applied once skin haemostasis is achieved to avoid bloody area at the puncture zone (Royse et al. 2006). In this study the lithotomy position for urologic cases and the possibility of getting wet back during cystoscopy may have affected the results in both groups.

We conclude that the fixation method is effective for avoiding epidural catheter migration. The simplicity, comfort, low-cost, durability in wet conditions and applicability in any surgical department are the advantages of this method.

Acknowledgements

An application has been made for patent certification for this device to the Turkish Patent Institute (patent no. 2006-G-144842).

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