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PROSPECTIVE RANDOMIZED COMPARITIVE STUDY ON USAGE OF EPISURE AUTODETECT SYRINGE VERSUS GLASS SYRINGE IN LOWER THORACIC EPIDURAL ANALGESIA

Anaesthesiology

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ABSTRACT

Episure & AutoDetect syringe (EAS), a spring-loaded syringe, is a new loss-of-resistance syringe used to identify epidural space. It has an advantage of subjective and objective confirmation in identifying epidural space over glass syringe (GS) for beginners. We compared the performance of EAS with that of GS for identifying epidural space in lower thoracic epidurals.

Methods: A total of 40 American Society of Anesthesiolgists I-II patients aged 18-60 years requiring lower thoracic epidural analgesia for surgery were randomised into Group I (EAS): Epidural identified using EAS and Group II (GS) epidural identified with GS. Patient demographic data, depth to epidural space (cm) was noted

Results: There were no differences in patient demographics or depth to the epidural space between the two groups. When epidural was identified in fewer attempts, the time needed to identify epidural space was quicker with EAS .

Conclusion: Using EAS allowed reliable and quick identification of the epidural space in lower thoracic epidural technique as compared to use of glass syringe.

KEYWORDS

Epidural , Episure ,epidural space, time to reach

1.INTRODUCTION

The loss-of-resistance technique is routinely used to identify the epidural space. The Episure AutoDetect syringe (EAS) manufactured by Indigo Orb, Inc., Santa Clara, CA, USA is a new syringe with an internal compression spring that applies constant pressure on the plunger This obviates the need to apply pressure on plunger, allowing operator to use both hands while continuously advancing the epidural needle. The plunger automatically depresses when needle enters epidural space, providing an objective, visual confirmation of LOR, as opposed to subjective "feel" required with standard LOR syringes. These advantages may help the resident anaesthesiologist to achieve higher success rate in identifying the epidural space. In an observational pilot study, the use of the device was reported to confer increased success in epidural space identification, primarily with resident anaesthesiologists. [2] Few studies had demonstrated the usefulness of this syringe in identifying lumbar epidural space in labour analgesia, but none of the studies tested this device in thoracic epidural. [1],[2] In this study, we compared the performance and the success rate of EAS, a spring-loaded syringe versus glass syringe (GS) when used to identify epidural space using LOR technique with saline for lower thoracic epidurals by resident anaesthesiologists.

2. METHODS

After Ethical Committee approval and written informed patient consent, 40 patients aged 18-60 years, American Society of Anesthesiolgists (ASA) physical status I-II, who were planned to undergo upper and lower abdominal surgeries and needed post-operative analgesia were enrolled for the study. Exclusion criteria were ASA physical status grade 3 or more, history of anticoagulant treatment, abnormal spine, history of neurologic, psychiatric and cardiopulmonary disease, active liver or renal impairment and pregnant women.In this prospective randomised control study, epidural analgesia was performed by resident anaesthesiologists (who had already performed at least 50 thoracic or lumbar epidurals) using an 18-gauge Tuohy needle in the space between T10-T11 with the standard GS or the spring-loaded syringe in the right lateral position. The residents performed epidurals using GS, which was alternated with the spring-loaded syringe. Randomisation was achieved using computer software. In Group I (EAS), epidural space was identified with EAS, a spring-loaded syringe and Group II (GS), with GS. All providers watched a training video about the spring-loaded syringe before study commencement. Saline was used for the LOR with both syringes. The placement of the epidural catheter was performed before the induction of general anaesthesia (GA). Epidural analgesia was initiated using 10 ml of 0.25% bupivacaine with fentanyl 2 [micro]g/ml, GA was performed after confirming the success of epidural block. At the end of surgery, epidural was topped up before wound closure for post-operative analgesia. The following variables were recorded: Patient demographic data, depth of the epidural space, number of attempts, time to locate the epidural space, and inadvertent dural puncture. In case of accidental dural pucture, the catheter was resited in another space using the same type of syringe. The occurrence of false LOR and failed epidural analgesia were also noted. The failed epidural analgesia was defined as the need to resite the epidural catheter due to failure to obtain sensory blockade after giving an initial loading dose of the local anaesthetic. The time to locate the epidural space was measured by the attending anaesthesiologist supervising the resident using a stopwatch that was started as soon as the syringe was attached to the Tuohy needle (with the needle tip in inter spinous ligament, as per the manufacturer's recommendation), and stopped when the epidural space was identified as indicated by visual inspection of LOR.

3.RESULTS

Of 40 patients that were evaluated for the study, Demographic data were similar in both the groups and there was no difference in the depth of epidural space between two groups

Table No 1: Data For Two Groups

	GROUP 1	GROUP 2	P VALUE
AGE IN YEARS	49.3 ± 7.88	51.7 ± 0.88	0.3699
OPERATOR EXPERIENCE IN YEARS	1.8 ± 0.89	2.05 ± 0.88	0.2512
SKIN TO EPIDURAL SPACEIN CMS	3.89 ± 0.366	3.91 ± 0.382	0.8504

Table No 2 : Adverse Events Between Two Groups

	GROUP 1	GROUP 2
DURAL PUNCTURE	0/20	2/20
DIFFICULTY IN CATHETER THREADING	1 CASE	1 CASE
FAILED EPIDURAL	0/20	2/20

4. DISCUSSION & CONCLUSION

Epidural analgesia and anaesthesia are commonly used as a form of pain relief during childbirth, for the treatment of chronic back pain or as a means to provide anaesthesia or analgesia during specific operations. Epidural needle insertion is essentially a blind procedure. The failure of epidural analgesia usually results from failure to identify the epidural space correctly. During an epidural insertion, the operator tries to perceive which tissue layer the needle tip is passing through by feeling the resistances on the needle. This is a process known as 'haptic' feedback. [4] A well-known technique referred to as LOR essentially involves identification of the epidural space by compression of either fluid or air as the epidural needle encounters the various ligaments of the lumbar vertebral column. This was first explained in early 20 th century and is the most common method used by many

anaesthesiologists. Sicard and Forestier used fluid as a medium for this technique in 1921. Dogliotti explained the principle behind it and popularised the technique. [5] The advantages of this technique are that it is easy to learn, cost effective, and not cumbersome with high sensitivity and specificity. People who have experience in appreciating 'give way' feel can adopt this technique. It is not a very good technique for the beginners. Both air and fluid can be used as a medium for this technique, but the debate is still on as to which medium is superior. Air becomes the popular medium with some reasons. First is historical, as until the 70's, syringes were made from glass and were non-disposable. Disadvantages of using air are possibility of causing pneumocephalus [6],[7] headache,[5] cervical emphysema, [8] patchy block, and air embolism. [8].With the availability of plastic syringes fluid gained popularity as a medium as it eliminated most of the problems of air as a medium. The main disadvantages with the use of saline are dilution of local anaesthetic agent affecting sensory blockade, and confusion with cerebrospinal fluid if accidental dural puncture occurs.The LOR is a subjective feeling, so most of the failure rates occur with inexperienced practitioners. [9] Baraka A reported 'saline infusion technique' in which the saline from the infusion set enters the epidural space as there is negative pressure in the epidural space. [10] The main advantage of this technique is that the needle can be gripped by both the hands and also directed according to the needs. It is easy to learn especially for beginners, has a high success rate. Based on this principle, a new spring-loaded AutoDetect syringe Episure was designed by Indigo Orb, Inc., Santa Clara, CA, USA. In EAS, the constant pressure applied may confer increased success of correct epidural space identification. Visual observation of LOR with the spring-loaded syringe removes operator subjectivity and variability; thus, its use might offer a more precise end-point compared with the standard GS. [2] It has been suggested that the incidence of dural puncture might be reduced when using LOR to saline while applying constant pressure on the plunger.[11],[12] The quicker identification of the epidural space with the spring-loaded syringe as compared to GS might partly be attributed to the difference between using continuous pressure to advance the needle in the spring-loaded syringe group compared with intermittent advancement by some providers in the GS group. This finding is similar to that of Habib et al .,[2] who noted that the median elapsed time with the spring-loaded syringe versus a conventional GS was 20 s (11-28 s) and 40 s (25-58 s) respectively ($P < 0.001$) with epidural analgesia in parturient.Previous studies demonstrated the success of spring-loaded syringe in lumbar epidural for labour analgesia, but in our study done in lower thoracic epidurals for abdominal surgeries are equally efficient and successful even though the thickness of ligamentum flavum is thinner in thoracic epidural space.Though this study demonstrated statistically significant difference between the two syringes in the time to identify the epidural space, a difference of 8-10 s didn't give much advantage of EAS over GS. This difference is likely further reduced in the hands of experienced anaesthesiologists.Future studies are required to determine if the spring-loaded syringe leads to similar reduction in accidental dural punctures and reduces the time to enter epidural space by experienced anaesthesiologists.The spring-loaded syringe provides an opportunity to use both hands and hence the residents had better control over the needle advancement and success rate improved when compared to the GS.

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