ORIGINAL ARTICLE

A COMPARATIVE STUDY OF LOSS OF RESISTANCE TECHNIQUE AND MODIFIED DRIP METHOD FOR IDENTIFICATION OF EPIDURAL SPACE

Kishan Rao B[1], Prakash Rao N[2], S. G. K. Murthy[3]

HOW TO CITE THIS ARTICLE:
Kishan Rao B, Prakash Rao N, S. G. K. Murthy. "A Comparative Study of Loss of Resistance Technique and Modified Drip Method for Identification of Epidural Space". Journal of Evidence based Medicine and Healthcare; Volume 1, Issue 14, December 08, 2014; Page: 1810-1815.

ABSTRACT: OBJECTIVE: To compare and evaluate the success rate of modified drip method (MDM) with the conventional loss of resistance (LOR) technique in locating the lumbar epidural space. **MATERIALS AND METHODS**: One hundred twenty patients of either sex, belonging to American society of Anesthesiologists physical status class 1 or 2 scheduled to undergo elective surgeries were randomly assigned to one of the two groups (60 each) depending on epidural space localization. In LOR group, epidural space localization was done by using conventional loss of resistance technique to the injection of air. In MDM group, epidural space was localized by using modified drip method. Time taken for epidural space localization (T_1), time taken to thread epidural catheter (T_2) and quality of the block were recorded. **RESULTS**: Success rate for epidural space localization was higher (90%) in MDM group compared to the LOR group (70%) but the difference was found to be statistically non-significant. T_1 was more in MDM group whereas it was reverse in case of T_2. Complications were almost negligible in MDM. **CONCLUSION**: Modified drip method is viable alternative to the conventional loss of resistance technique for identifying lumbar epidural space.
KEYWORDS: Epidural space identification, MDM, LOR.

INTRODUCTION: Epidural anesthesia has been used since 1885. It is a blind procedure, and is difficult to accurately identify the epidural space resulting in about 1.5% failure rate.[(1)] Epidural anesthesia provides operating conditions as good as subarachnoid anesthesia while at the same time avoiding some of the disadvantages of the latter. While isolated cases of neurological sequelae following epidural anesthesia continue to be reported, the incidence is much less than that following subarachnoid anesthesia. In comparison with relaxant techniques, epidural block also provides many advantages such as quiet respiration, minimal bleeding and contracted bowel. Despite the many advantages of epidural anesthesia, it is not widely employed of due to the perceived difficulty in locating the epidural space. The other disadvantages are the fear of inadvertent dural puncture resulting in a total spinal block. Techniques for identification of epidural space are numerous and are largely divided into tactile and visual methods. The most commonly used technique is manually detected loss of resistance to the injection of air or saline. Baraka (1972) described a loss of resistance technique using gravitational hydraulic forces rather than a manually generated pressure.[(2)] This technique was modified and introduced into clinical practice by Michel and Lawes, and is known as modified drip method.[(3)]

The modified drip method is reported to have a higher degree of success as compared to the conventional methods. In this study we have compared and evaluated the success rate of the

modified drip method with the conventional loss of resistance technique in locating the lumbar epidural space.

MATERIALS AND METHODS: The study was approved by Hospital Ethical Committee and informed consent from all the participants was obtained. One hundred twenty patients of either sex belonging to American society of Anesthesiologists physical status I or II, undergoing elective operations in which lumbar epidural anesthesia could be used for intraoperative and postoperative pain relief were included for this randomized, prospective and controlled study. The patients with local infection, spinal column abnormalities, previous spine surgery, congenital or acquired coagulation disorders, were excluded from the study.

All the participants were randomly assigned to one of the two groups. LOR group (Group I): In this group, the lumbar epidural space was identified by using the conventional technique of loss of resistance (LOR) to the injection of air. MDM Group (Group II): In this group, the lumbar epidural space was identified by using the modified drip method (MDM).

Patients were examined preoperatively and were subjected to complete general physical as well as systemic examination. All routine investigations were done, patients were kept fasting for 6 hours preoperatively. In the operation theatre, after the establishment of intravenous line and attachment of standard monitors (non-invasive blood pressure, electrocardiography and pulseoxymetry), epidural blocks were given to the patient in lateral position by the same clinician, under all aseptic precautions using 17G Tuohy epidural needle (Ramsons scientific and surgical industries pv.t ltd.) at the L_3-L_4 or L_4-L_5 interspace. In all the cases, an epidural cathter was introduced after identifying the epidural space.

Epidural space localization was attempted with either of the above mentioned two techniques. Maximum three attempts were taken for epidural space localization by the given technique. After successful epidural space localization, a test dose of 3ml of 2% lignocaine with 1:2,00,000 adrenaline (except in cases where adrenaline was contraindicated) was given through the catheter after negative aspiration for cerebrospinal fluid or blood. A bolus dose of 1.5ml per segment of 2% lignocaine with adrenaline 1:2,00,000 was injected.

Patient's demographic data like age, sex, weight were noted. Distance of epidural space from skin, time taken for epidural space localization T_I (Time taken in seconds to identity lumbar epidural space by LOR / MDM) and T_2 (time taken in seconds to thread epidural catheters) and quality of the block were recorded during the study. Sensory block was assessed by pinprick method and asking patient to raise lower limbs without bending the knees.

Level of blocked dermatome was recorded and achieved level was graded as:

1. **Successful:** Satisfactory sensory & motor block without any unblocked segment.
2. **Failure:** No segment blocked (or) accidental dural puncture or inability to thread the catheter.

Incidence of complications such as dural puncture, bloody tap and root irritation were recorded in the two techniques.

The data collected during the study period was compiled and analyzed statistically by using ANOVA f-test (quantitative data) and chi-square test (qualitative data).

RESULTS: All the one hundred twenty patients were randomly assigned to one of the two groups (LOR or MDM) resulting in each group comprising of 60 patients each. The mean age, sex, and weight of the subjects were comparable in both groups (Table-I).

Group	Sex Male female	Age(years) (Mean +SD)	Weight(kg) (Mean +SD)
LOR	18 42	47.87 +11	51.9 +7.8
MDM	22 38	46.6 +13.03	54.47 +9.74
P value		0.20(NS)	>0.5(NS)

Sensory block was graded to define the quality of the block as successful and failure (Table-2) Though the success rate was higher in MDM group as compared to the LOR group (90% to 70%), The difference was not statistically significant (0.10<p<0.20).

Group	Successful location of epidural space	Failure to locate epidural space
LOR (n=60)	42	18
MDM (n=60)	54	6
Total	96	24

X^2 =2.604 (0.10<P<0.20)

Accidental dural puncture was seen in one patient of MDM group whereas in LOR group it was in ten cases and the difference was found statically non-significant (p=0.18) The mean time taken to identify the epidural space (T_1) and the mean duration of time taken to thread the epidural catheter (T_2) was recorded for both groups which are also not significant (Table-3).

Group	Time taken to identify lumbar epidural space T_I (Seconds)	Time taken to thread Epidural catheter T_2 (seconds)
LOR	92.78 + 100.06	71.95 + 82.15
MDM	118.3 + 149.8	47.07 + 34.45
P value	P = 0.2 (NS)	P= 0.2(NS)

DISCUSSION: Accurate identification of the epidural space is the most important requisite for the success of epidural anesthesia several methods to identify the epidural space depend on either existence of a negative pressure within the space or the manual loss of resistance (LOR) to the injection of air or saline as the needle pierces the ligamentum flavum and enters the epidural space.[3] But drip infusion technique depends neither on LOR nor on negative pressure. Using air in LOR syringe has disadvantages, as air being compressible, so that detection of epidural space

is more difficult and false positives are possible. In addition there are also possibility of venous air embolism, more unblocked segments and cervical subcutaneous emphysema if large volumes of air injected into extradural space.[4,5,6]

In our study, we compared the modified drip method (MDM) with the loss of resistance (LOR) technique for obtaining successful epidural anesthesia. Baraka (1972) first used the drip method to identify the epidural space with a 100 % success rate.[2] Michel and Lawes (1991) Modified the original drip method with 95 % success rate in less than a minute and there were no unintentional dural punctures.[3] In the same year Yamashita and Tsuji used the drip method with a success rate of 97%.[7] Kumagai and Yamashita (1995) did another study using the drip method with an overall success rate of 96%.[8] In our study we found a success rate of 90/.in MDM group (51/60 patients) and 70% in LOR group (42/60 patients). However, the difference between the two groups did not reach statistical significance (chi square test with Yates correction x^2=2.604). Using air for LOR syringe technique, might have led to more unblocked segments leading to decreased quality of block.[9]

The success rate achieved in our study using MDM method is low compared to other studies. This could possibly have resulted from the fact that in our study, the establishment of complete epidural anesthesia after the injection of a bolus dose of local anesthetic through the epidural catheter was taken as successful end point to identify epidural space.

Among the failures in LOR Group, four were due to accidental dural puncture during identification of epidural space, six were due to accidental dural puncture during threading of epidural catheter. A high incidence of dural puncture is reported in other studies using the LOR technique, particularly in the elderly.[10] In comparison, there was a lower incidence of accidental dural puncture during threading of the catheter in the MDM group. This higher incidence of accidental dural puncture in the LOR group could be due to the fact that epidural location of the needle tip is checked intermittently after advancing the needle, making direct dural puncture a distinct possibility. In contrast, the entry of tip the epidural needle is being checked throughout the period of advancement of the needle in MDM group, results in tip of needle being in posterior part of epidural space at the time when drip starts flowing freely. Introduction of epidural catheter to be directed away from the duramater (because of specially designed Huber point of Tuohy needle), thereby making accidental dural puncture less common.

The mean time taken to identify the epidural space (T1) in LOR group was low compared to MDM group and was statistically not significant (p=0.2) but the mean time taken to thread the epidural catheter (T2) was more in LOR group to MDM group which is also statically not significant.

The advantage of LOR air syringe technique is its simplicity as no special apparatus is required, but it may be clumpsy as the anesthetist must divide attention between exerting pressure & introducing needle.

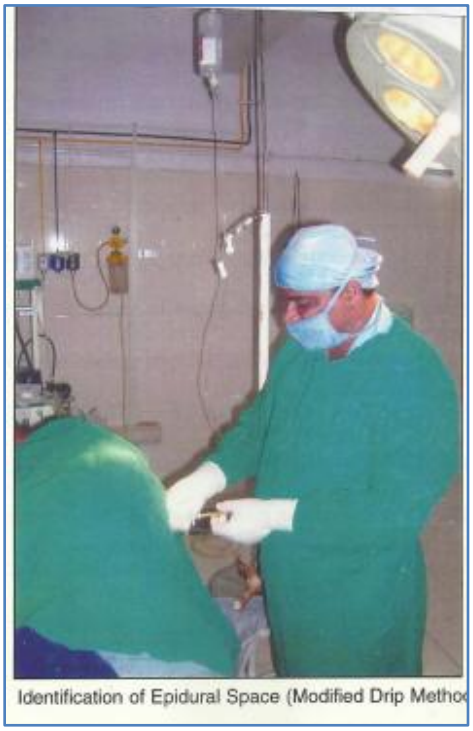
The MDM has many advantages, there is constant pressure applied continuously to the end of the Tuohy needle, anesthetist can advance the needle with both hands making the grip more sensitive. This increased control over the movement of the needle should reduce the incidence of unintentional dural puncture. There is reduced incidence of false loss of resistance

sign and the end point of entry of the tip of the needle is unmistakable due to free flow of the drip.

Our study shows that though it takes longer time to identify the space in MDM group to LOR group, it takes less time to thread the epidural catheter in MDM group. The higher incidence of successful epidural anesthesia in MDM group as compared to LOR group (90% versus 70%) prompts to recommend MDM technique as an alternative to the conventional methods currently in use.

We conclude that the modified drip method is a viable alternative to the conventional loss of resistance technique for identifying the lumbar epidural space.

MODIFIED DRIP METHOD: After cleaning and draping the back of the patient, the lumbar interspinous space that was best felt was identified. Local anaesthetic was injected into the selected space and a thick needle track created to facilitate introduction of a 17G Tuohy needle into the interspinous ligaments. The stylet was then removed and a sterile intravenous set connected to the hub. Prior to connection, the intravenous set was connected to a 500 ml bottle of isotonic saline and the drip chamber of the intravenous set filled leaving the remaining part of the tubing beyond the drip chamber empty. The bottle was hung on an intravenous stand such that it was 1 meter above the level of the vertebral column. The male end of the intravenous set was connected to the hub of the epidural needle and the clamp of the intravenous tubing released completely. The epidural needle was advanced slowly using both hands while constantly watching the drip. As soon as the drip started to flow freely (indicating entry into the epidural space), the intravenous drip connected to the epidural needle was clamped to prevent saline from entering the epidural space.



Identification of Epidural Space (Modified Drip Metho

REFERENCES:

1. Dawkins M. The identification of the Epidural space. A critical analysis of the various methods employed. Anaesthesia 1963; 18: 66-77.
2. Baraka A. Identification of the epidural space by a running infusion drip. Br J Anaesth 1972; 44: 122.
3. Michel MZ, Lawes EG. Identification of epidural space by drip method. Reg Anesth 1991; 16: 236-9.
4. Stevens RA, Sharrock NE. Epidural Anesthesia. Essentials of Pain Medicine and Regional Anesthesia. 2nd ed. Philadelphia: Churchill Livingstone; 2005. P. 575-6.
5. Bromage PR. Identification of epidural space. In: Bromage PR, editor. Epidural Analgesia. Philadelphia: WB Saunders; 1978. P. 176-214.
6. Singhal S, Bala M, Kaur K. Identification of epidural space using loss of resistance syringe, infusion drip and balloon technique: A comparative study. Saudi J Anesthesia, Vol. 8, Nov 2014; 541-5.
7. Yamashita M. Tsuji M. Identification of the epidural space in children. The application of a micro-drip infusion set. Anesthesia 1991; 46: 872-4.
8. Kumagai M, Yamashita M. Sacral intervertebral approach for epidural anesthesia in infants and children: Application of "drip and tube" method. Anaesth Intens Care 1995; 23: 469-71.
9. Fyneface-Ogan S, Mato CN. A clinical experience with epidural balloon in the localization of the epidural space in laboring parturients. Nig Q J Hosp Med 2008; 18: 166-9.
10. Curelaru I. Identification of the Epidural space by air-fluid reflux. Prakt Anaesth 1976; 11: 424-7.

AUTHORS:

1. Kishan Rao B.
2. Prakash Rao N.
3. S. G. K. Murthy.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Anaesthesiology, Mamata Medical College, Khammam, Telangana.
2. Consultant Anaesthesiologist, Department of Anaesthesiology, Mamata Medical College, Khammam, Telangana.
3. Professor and HOD, Department of Anaesthesiology, Mamata Medical College, Khammam, Telangana.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Kishan Rao B,
Associate Professor,
Department of Anaesthesiology,
Mamata Medical College,
Khammam, Telangana.
E-mail: kishanraobagam@gmail.com

Date of Submission: 24/11/2014.
Date of Peer Review: 25/11/2014.
Date of Acceptance: 26/11/2014.
Date of Publishing: 08/12/2014.