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RESEARCH ARTICLE
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TRANSDUCING EPIDURAL PRESSURE AS A BETTER ALTERNATIVE TO CORRECTLY IDENTIFY EPIDURAL SPACE COMPARED TO LOR TECHNIQUE.

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INTRODUCTION

Epidural space identification has traditionally been done using the "loss of resistance " technique which, unfortunately, is not full proof and the difficulties we face sometimes is when

1. The space is not appreciated satisfactorily
2. We land up in a so called false space
3. We overshoot the epidural space, failing to appreciate by LOR

Here we have a promising and more scientific approach using pressure waveforms by transducing the epidural pressures, which appear as pul satile waveforms and in synchrony with heart rate.

AIMS AND OBJECTIVES

1. To observe the efficacy of transducing the epidural pressure in ascertaing the correct placement of needle in epidural space.
2. To demonstrate that, transduced epidural pressure as a better alternative to LOR technique in terms of both qualitative (waveforms) and quantitative (numeric values) confirmation of correct epidural needle placement.

METHODOLOGY

- The study was conducted as an non interventional observational study of patients presenting for epidural steroid injections
- The study was conducted in ESIC Model hospital after approval of ethics committee with a total subject of 22 patients.
- INCLUSION CRITERIA

All elective patients posted for epidural steroid injections were included for the study.

- EXCLUSION CRITERIA

All patients who won't benefit from epidural anesthesia or refusal for epidural anesthesia will be excluded from the study.

PROCEDURE

- Preoperative consent for epidural anesthesia was obtained
- Aseptic measures were taken, including cleaning the back with antiseptic solutions and draping.
- For half of the the patients selected, patients were positioned sitting upright, and a local anesthetic was administered at a predetermined site along the vertebral column. An epidural needle was inserted to identify the point of entry into the epidural space using the Loss of Resistance (LOR) technique.

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- This method is the standard practice for identifying the epidural space for long-term anesthesia by placing an epidural catheter or single-shot drug injections without catheter placement.
- Following the identification of the epidural space by the LOR technique, a pressure transducer was connected to the needle.
- The pressure readings were displayed on a monitor as a waveform and numerical values.

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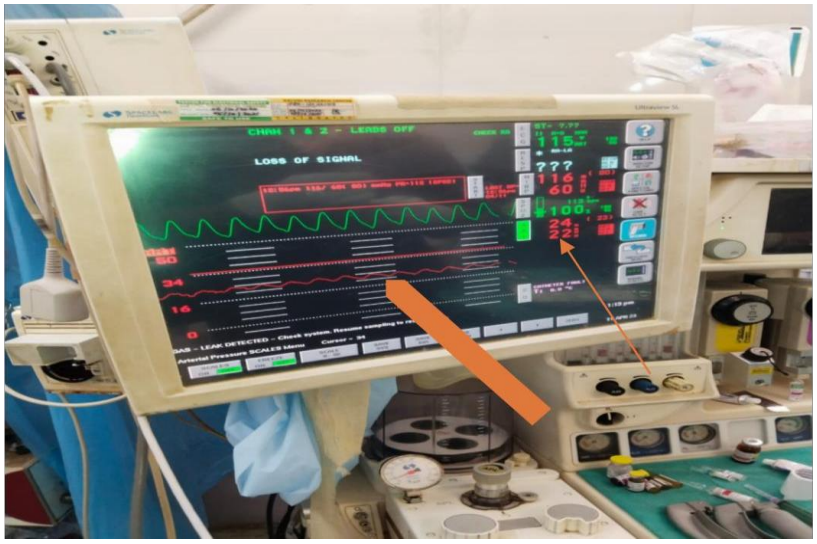
- Numeric data was collected, and the waveform readings were recorded.
- The transducer was disconnected from the epidural needle, and the rest of the procedure followed standard practice.
- For the other half of the patients transducer was connected directly to

the epidural needle and was advanced till the desired waveform and pressure readings were observed.

PARAMETERS MONITORED

- A. DURING THE PROCEDURE
- 1.Oxygen saturation (SPO2)
- 2. Pulse rate (PR)
- 3. Non-invasive blood pressure (NIBP)
- 4. Feelings of any parasthesia.
- B. AFTER THE PROCEDURE
- Routinely conducted pain scoring system to evaluate the analgesia produced by epidural injection of anesthetic drugs was employed and since the paitent sample were for epidural steroid injections, they were followed up after 7 days to determine eficacy of the drug[as steroids act slowly and any significant pain relief is seen after 4 to 5 days]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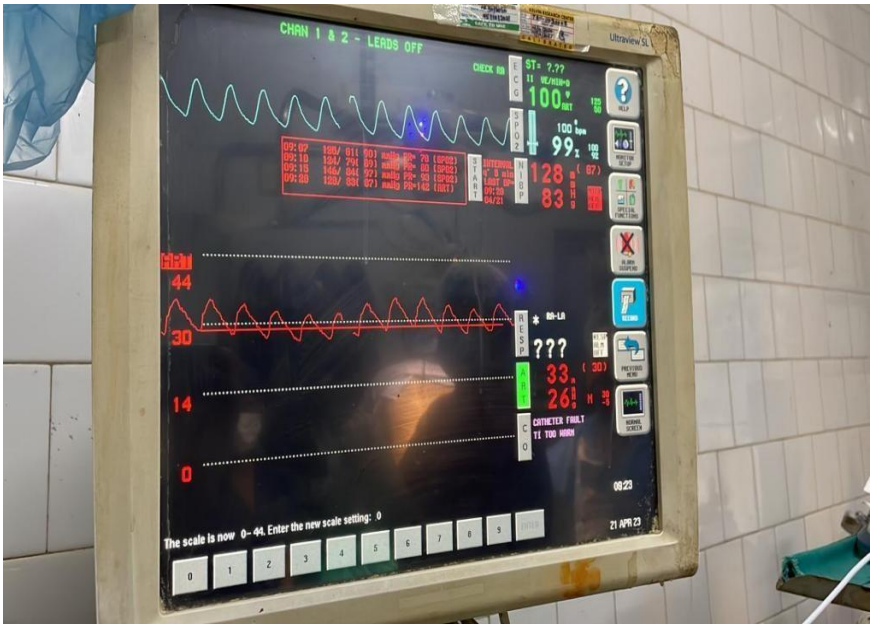
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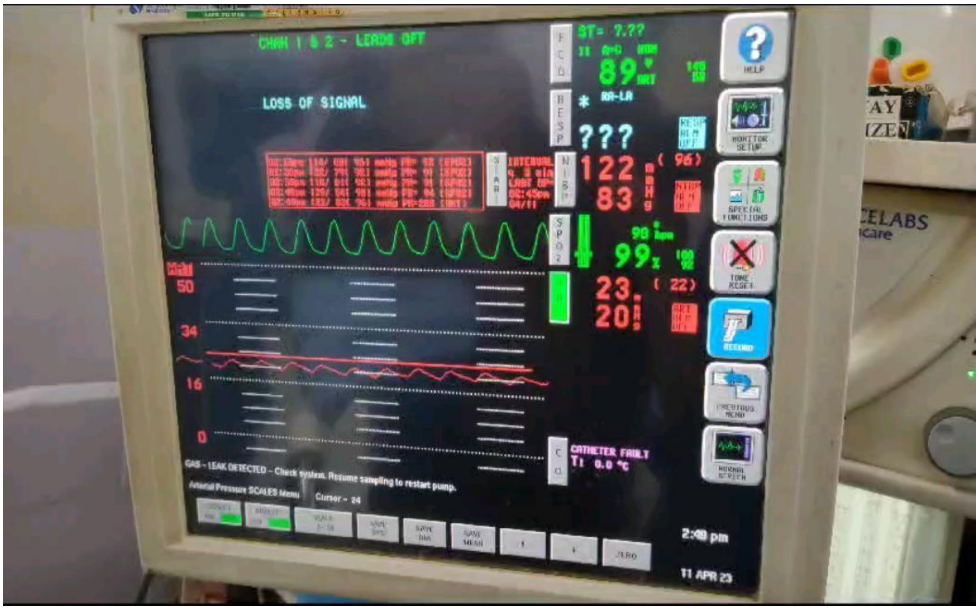
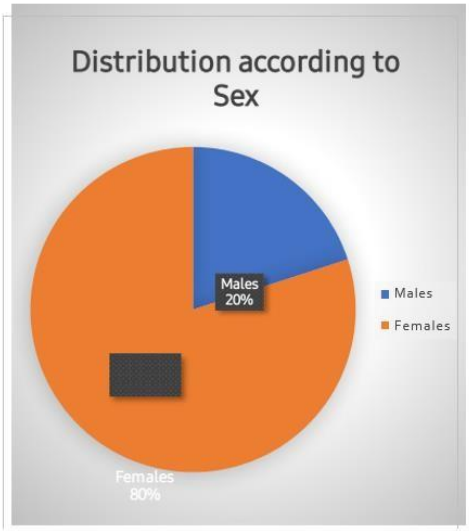
CHAN 1 & 2 - LEADS OFF

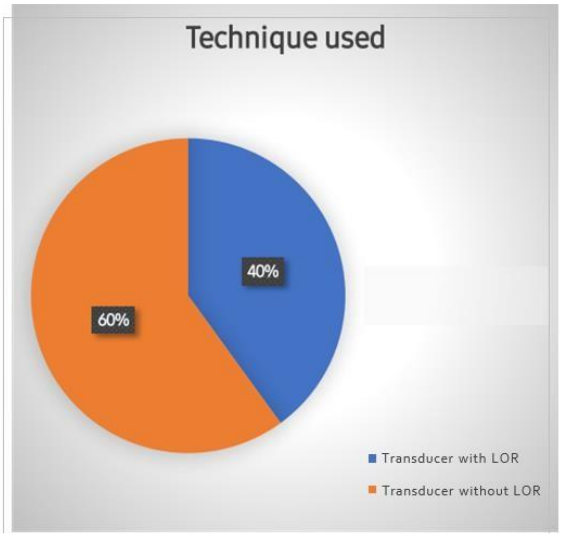


WAVEFORM	LOR
33/ 18	Positive
28 / 20	Positive
3 0 / 17	NEGATIVE
28/ 16	Positive
3 4 / 2 0	NEGATIVE
3 1 / 19	Positive
32 / 19	Positive
Not_Found	Not_Found
3 5 / 16	Positive
27/ 15	NEGATIVE
26/ 18	Positive

WAVEFORM	LOR
28/20	Positive
Not Found	Not Found
29/ 17	NEGATIVE
29/ 19	NOT DONE
33/ 18	NOT DONE
34/20	NOT DONE
35/ 16	NOT DONE
31 /21	NOT DONE
27 / 18	NOT DONE
32 /20	NOT DONE
34/ 14	NOT DONE

Statical Analysis





Minimum Age	Maximum age	Mean Age	Standard Deviation
22	67	42.75	12.47

Comparison of Pain Score

Pain Score (VAS) after	Transducer with LOR (mean Score)	Transducer without LOR (mean Score)	Student's- test P-value
Day 1	6.13 ± 0.99	6.08 ± 0.90	0.92
Day 2	4.38 ± 0.74	4.83 ± 0.71	0.18
Day 7	2.75 ± 0.46	3.33 ± 1.1	0.19
Day 14	2.63 ± 0.51	2.42 ± 0.66	0.46
1 Month	2. 50 ± 0.53	2.25 ± 0.45	0.27

COMPARISION OF MEAN BLOOD PRESSURE

MBP	**Transducer with LOR (Mea Score)**	**Transducer without LOR (mean Score)**	**Student's- test P-value**
Pre-Procedure	78.25 ± 8.12	78.25 ± 6.87	1.0
Post-procedure	76.38 ± 6.56	78.92 ± 6.41	0.40
Post 5 mins	79 ± 6.14	80.67 ± 6.69	0.58
Post 15 mins	79. 25± 5.94	82.92± 6.21	0.20
Post 30 mins	78.63 ± 6.09	81.5 ± 5.41	0.28
Post 45 mins	78.75 ± 5.54	83.17 ± 5.82	0.10
Post 60 mins	81. 75± 10.32	78.08± 7.90	0.38

Comparison Of Heart Rate

HR	**Transducer with LOR (Mea Score)**	**Transducer without LOR (mean Score)**	**Student's- test P-value**
Pre-Procedure	84.13 ± 12.33	83.83 ± 10.46	0.95
Post-procedure	92.38 ± 8.08	86.92 ± 8.53	0.17
Post 5 mins	90.75 ± 8.86	87. 50 ± 8.41	0.41
Post 15 mins	88.88± 7.16	85.08 ± 7.85	0.28
Post 30 mins	85.88 ± 7.33	81.17 ± 7.32	0.17
Post 45 mins	86.38 ± 6.94	77.08 ± 6.65	0.008
Post 60 mins	82.88± 14.56	84. 5± 9.85	0.76

Comparison of SPO_2

SPO_2	Transducer with LOR (Mea Score)	Transducer without LOR (mean Score)	Student's- test P-value
Pre-Procedure	98.75 ± 0.7	98.92 ± 0.90	0.66
Post-procedure	95.5 ± 9.54	98.92 ± 0.79	0.22
Post 5 mins	96 ± 8.5	98.92 ± 0.51	0.24
Post 15 mins	96. 25± 7.77	99 ± 0.0	0.23
Post 30 mins	96 ± 5.68	98.5 ± 0.67	0.14
Post 45 mins	95.75 ± 6.38	96.75 ± 5.62	0.71
Post 60 mins	87.63± 32.58	98.92± 0.66	0.23

Results

In 8 cases where LOR method was performed along with the Transducer
method were compared with 8 cases in which direct Transducer method was used.
The mean pain (VAS) scores of both the methods were compared on D1, D2, D7, D14 and after 1 month. After applying student 's t-test it was found that there is no significant diference between these two methods (p-value >0.05).
The MBP, Heart rate, and SPO2 were also compared at Pre-Procedure, Post- procedure, Post 5, 15,30,45 and 60 mins. The diference between these two independent variables after applying student 's t-test became statistical
insignificant. (p-value >0.05) except HR at 45 minutes.
It implies thathat transducer method had no negative impact on hemodynamics.

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- In 4 cases however, LOR had failed initially but space was identified by transducer.
- In 2 cases where transducer failed to generate an identifiable waveform, LOR did not succeed also.

CONCLUSION

- We found that epidural pressure waveforms showed positive results, along with LOR technique as well as independently.
- When pressure transducer technique had failed, the LOR had already failed.
- So, as a method of identifying the epidural space positively, pressure transducer shows promising alternative to LOR and can be used as a fi rst line
method for identifying the epidural space.
- Larger clinical studies are needed to further defi ne the sensitivity, specificity, PPV or NPV of epidural pressure transducer waveform analyses.

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