

## Background and Hypothesis



### AIM

To evaluate the difference between patient-perceived midline and US defined midline and the clinical implications of any discrepancies.

### Observational Study Using Ultrasound to Assess Midline Labor Epidural Analgesia Placement and Analgesic Efficacy

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This study by Weiniger et al is limited by its lack of patients included in the study with a BMI >40 (n=1).

- ★ Obstetric neuraxial success require accurate identification of midline.
- ★ Physiologic and anatomic changes during pregnancy may distort surface landmarks and patient-perceived midline (PPM) may not correspond to true spinal anatomy.
- ★ Existing literature on PPM vs ultrasound-defined midline (USDM) is limited by few patients with BMI >40.
- ★ Our goal is to compare PPM with USDM in parturients undergoing neuraxial anesthesia and evaluate the clinical implications of any discrepancy.
- ★ We hypothesized that PPM will frequently differ from USDM with larger discrepancies in patients with higher BMI.
- ★ Greater deviation is expected to correlate with reduced first-pass success.

## Study Design and Methods



### AIM

To evaluate the difference between patient-perceived midline and US defined midline and the clinical implications of any discrepancies.



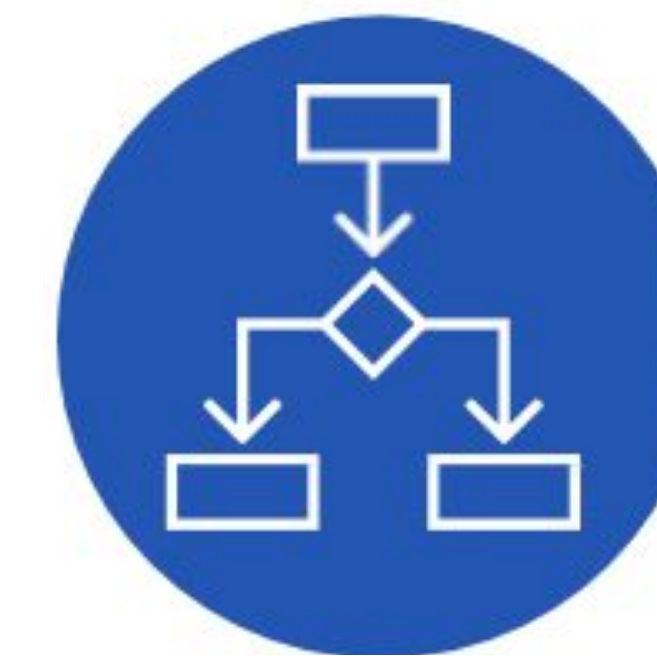
### METHODS

A prospective observational study. Patient perceived midline and US defined midline were obtained and marked on the skin. The distance between these two points were measured. Demographic data was obtained from the EMR.



### POPULATION

English-speaking parturients requesting neuraxial for labor analgesia, or requiring neuraxial anesthesia for obstetric procedures (ie, cerclage, Cesarean delivery) with no known scoliosis  
n= 50, interim analysis (15 patients with BMI >40)



### OUTCOMES

1 °: absolute distance (mm) between patient identified midline and ultrasound identified midline  
2 °: number of needle passes  
Exploratory: BMI, gestational age, parity, cervical dilation, incidentally found scoliosis and edema

RESULTS



- Interim analysis showed:
  - Distance between perceived and US-defined midline ranged 0-13 mm
  - Mean distance = 4.4 mm
  - Standard deviation = 3.6 mm
  - Average number of needle passes = 1.54

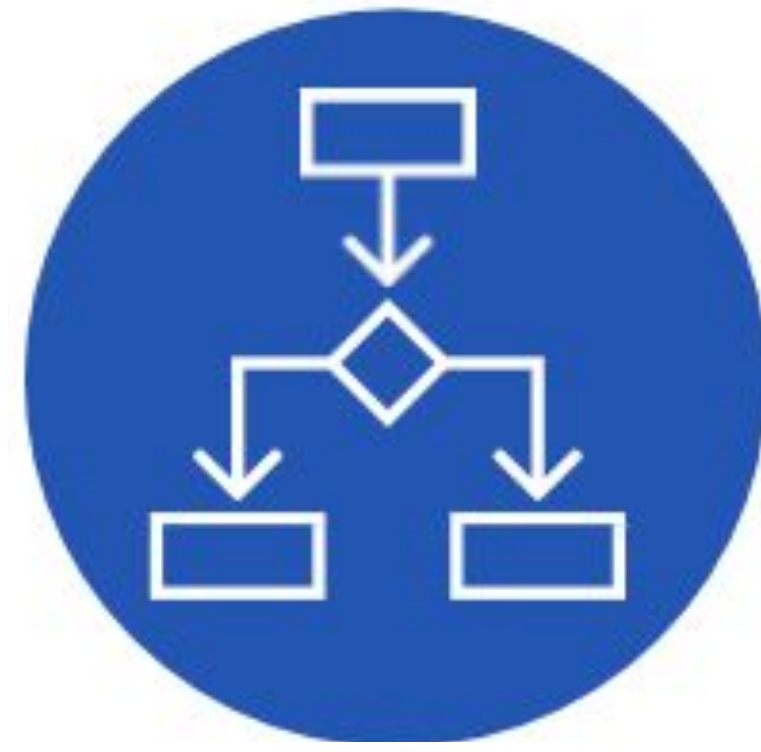
Table 4: Correlation between midline distance and patient characteristics

|                              | Pearson correlation (95% CI) | P-value |
|------------------------------|------------------------------|---------|
| BMI                          | 0.22 (-0.08, 0.49)           | 0.151   |
| Gestation                    | 0.27 (-0.03, 0.53)           | 0.0753  |
| Parity                       | 0.12 (-0.18, 0.41)           | 0.431   |
| Gestastional Age (weeks)     | -0.09 (-0.38, 0.22)          | 0.581   |
| Dilation                     | 0.28 (-0.02, 0.53)           | 0.0713  |
| number of neuraxial attempts | -0.02 (-0.32, 0.28)          | 0.897   |

Table 1: Summary of subject characteristics by whether distance between perceived and US midlines exceeds 1.51mm

|                                     | 1.51mm or Less<br>(N=13) | Greater than 1.51mm<br>(N=30) | Overall<br>(N=43) | P-Value |
|-------------------------------------|--------------------------|-------------------------------|-------------------|---------|
| <b>BMI</b>                          |                          |                               |                   |         |
| Mean (SD)                           | 33.1 (9.36)              | 37.8 (7.23)                   | 36.4 (8.12)       | 0.0391  |
| Median [Min, Max]                   | 29.3 [23.8, 56.6]        | 36.4 [27.9, 54.5]             | 34.0 [23.8, 56.6] |         |
| <b>Gestation</b>                    |                          |                               |                   |         |
| Mean (SD)                           | 2.15 (1.41)              | 2.83 (1.39)                   | 2.63 (1.41)       | 0.1     |
| Median [Min, Max]                   | 2.00 [1.00, 6.00]        | 2.50 [1.00, 6.00]             | 2.00 [1.00, 6.00] |         |
| <b>Parity</b>                       |                          |                               |                   |         |
| Mean (SD)                           | 0.615 (0.961)            | 1.20 (1.19)                   | 1.02 (1.14)       | 0.0501  |
| Median [Min, Max]                   | 0 [0, 3.00]              | 1.00 [0, 6.00]                | 1.00 [0, 6.00]    |         |
| <b>Gestastional Age (weeks)</b>     |                          |                               |                   |         |
| Mean (SD)                           | 38.4 (3.15)              | 36.5 (5.32)                   | 37.1 (4.81)       | 0.0401  |
| Median [Min, Max]                   | 39.1 [29.3, 41.1]        | 38.1 [15.0, 40.3]             | 38.3 [15.0, 41.1] |         |
| <b>Dilation</b>                     |                          |                               |                   |         |
| Mean (SD)                           | 1.92 (2.22)              | 1.67 (2.46)                   | 1.74 (2.37)       | 0.705   |
| Median [Min, Max]                   | 0 [0, 5.00]              | 0 [0, 10.0]                   | 0 [0, 10.0]       |         |
| <b>number of neuraxial attempts</b> |                          |                               |                   |         |
| Mean (SD)                           | 1.54 (0.967)             | 1.63 (1.27)                   | 1.60 (1.18)       | 1       |
| Median [Min, Max]                   | 1.00 [1.00, 4.00]        | 1.00 [1.00, 6.00]             | 1.00 [1.00, 6.00] |         |

- ★ No statistically significant correlation between any measured patient characteristic and midline distance when evaluating all comers.
- ★ Patient BMI >40 (obesity) did not correlate with more epidural attempts/more difficult epidural placement.
- ★ Further stratifying data into subcategories of clinically meaningful thresholds of midline deviation (1.5 mm, 3 mm, and 4.5 mm) revealed:
  - ★ Gestational age is earlier in subjects with a distance between perceived and US midlines greater than 1.5mm (P = 0.0401).
  - ★ BMI is higher in subjects with a distance between perceived and US midlines greater than 1.5mm (P = 0.0391).



## CONCLUSIONS

- ★ On average, patients will be able to accurately determine their midline within ~10 mm in either direction.
- ★ There is variation in patient reliability in identifying midline.
- ★ We failed to identify any patient characteristic that could predict which patients may be less accurate.
- ★ This suggests that clinically relevant midline deviation is not readily predicted by patient characteristics.
- ★ This study reinforces existing data showing that higher BMI is not correlated with reduced first-pass success.



## DISCUSSION

- We often ask our patients if they feel we are off to L or R – take their answers with a pinch of salt.
- Are they feeling our needle at the skin or in deeper layers like ligament?
- Does this simply reflect the standard 2 point discrimination of the skin on the back?
- Small changes at the skin result in bigger changes at the needle tip, depending on angulation and depth of the ligamentum flavum.

