The Relationship Between the High Frequency Heart Rate Variability Index (HFVI) and Epidural Analgesia in the Laboring Parturient

Morgane Factor MD, Genevieve Monanian MD, Bahaa Daoud MD, Alexa Christophides MHA, Samuel Stanley III MS, Elliott Bennett-Guerrero MD, Tiffany Angelo DO

Department of Anesthesiology[1], Renaissance School of Medicine, Stony Brook University, NY, 11794)

BACKGROUND

- The Mdoloris HFVI monitor measures high frequency heart rate variability
- HFVI is proposed as a non-invasive measure of parasympathetic tone
- HFVI has been shown to decrease significantly in response to painful stimuli and reflect the administration of analgesics in anesthetized patients
- Few studies exist examining its use in awake patients
- The ability to have a non-invasive, objective, physiologically based measurement of nociception would be highly useful for awake parturients experiencing labor

HYPOTHESIS

- By examining the impact of epidural analgesia on HFVI scores during the occurrence of uterine contractions, we hypothesize that there will be a correlation between HFVI, nociceptive stimuli, and reported pain scores

STUDY DESIGN AND METHODS

•Study Design:

•Double-blinded, prospective correlational study (N=20)

•Primary Endpoint:

•Strength of correlation between NRS pain score and HFVI prior to epidural placement

•Secondary Endpoint:

•Variance between HFVI values before and after epidural placement

•Correlation of NRS pain scores and HFVI before and after epidural placement

•Protocol:

•HFVI monitor sensors placed on consented subjects

•For at least 3 contractions prior to epidural placement, patients reported their numerical rating scale (NRS) pain scores at the beginning, the peak, and the resolution of uterine contraction

•Anesthesia team placed a dural puncture epidural at L3/4 or L4/5

•Epidural was loaded with 10 mL 0.125% bupivacaine in divided doses

•Uniform reporting resumed at least 15 minutes postloading dose for at least 3 contractions

•HFVI scores were recorded in a blinded fashion throughout this time

Table 1: Patient Demographics

Age (Years)	29.89 (± 4.61)
Parity	
0	11 (57.89%)
1	6 (31.58%)
2	1 (5.26%)
3	1 (5.26%)
Race	
White/Caucasian	14 (73.68%)
Black/African-American	2 (10.53%)
Asian	1 (5.26%)
Other	2 (10.53%)
Gestation (weeks and days)	39 weeks 2 days [38 weeks 4 days -40 weeks 1 day]
Onset of Labor	
Spontaneous	10 (52.63%)
Induced	9 (47.37%)
BMI	26.37 (± 4.053)

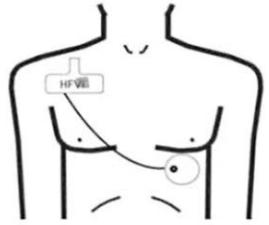

Figure 1: M-doloris HFVI Monitor Sensor

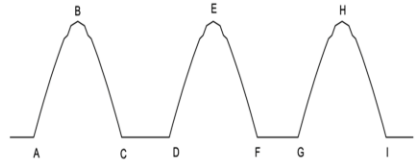

Figure 2: Contraction Diagram Example

RESULTS

•One patient was excluded from statistical analysis due to poor registration of the pre-epidural HFVI monitor values

•Fewer than 20% of the monitor's values were present from the beginning of contraction 1 to the end of contraction 2

•There was a significant (P<0.0001) negative linear relationship between HFVI and NRS values in the setting of uterine contractions before epidural placement

•There was a significant (P<0.0001) difference in the relationship between HFVI value and NRS pain score for post-epidural measurements compared to those taken before epidural placement

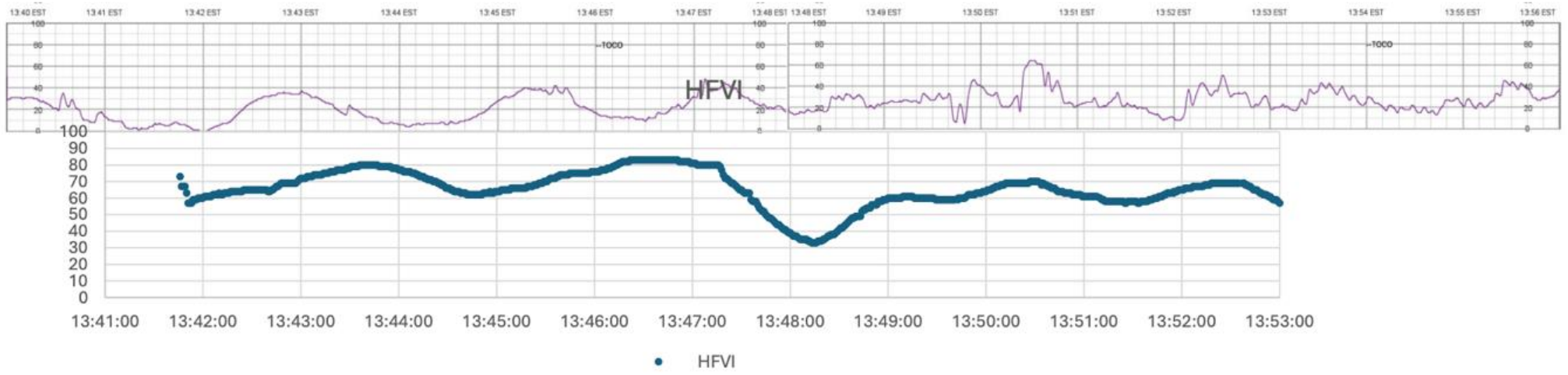

Figure 3: Sample Data of Cardiotocography with Superimposed HFVI Measurements

DISCUSSION

- In our prospective correlational study, HFVI, as determined with the Mdoloris ANI V1 monitor, had a significant negative correlation to self-reported NRS pain scores for awake parturients in labor before initiation of epidural analgesia
- HFVI values decreased when pain intensity increased
- Additionally, during the peak of uterine contraction, mean NRS pain scores and HFVI values displayed a negative relationship and were significantly decreased in the post-epidural period compared to pre-epidural period

CONCLUSION

- This suggests that the MDoloris monitor may have a role in developing an objective, quantifiable means of measuring nociception in awake, laboring parturients
- More studies are needed to evaluate if HFVI values can be used to evaluate and manage the effectiveness of epidural labor analgesia

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