Changes in pulse oximeter wave morphology during the onset of spinal anaesthesia for caesarean section.

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BACKGROUND:
• Caesarean section under spinal anaesthesia is one of the commonest operations in the UK (150000/year)
• Spinal anaesthesia commonly causes low blood pressure during this procedure
• Blood pressure is measured intermittently and this can miss the sudden onset of low blood pressure
• The principle cause of low blood pressure is vasodilatation
• The pulse oximeter waveform is known to change in response to vasodilatation
• We believe that pulse oximeter waveform analysis could be used to detect vasodilatation during the onset of spinal anaesthesia for caesarean section and thus enable prompt treatment which would avoid low blood pressure.

The pulse oximeter waveform has two components:

- Systolic wave = flow from pressure wave from the heart to the finger
- Dicrotic wave = a backward-travelling ‘reflected’ pressure wave, the speed of which depends on arterial muscle tone.

Change in the position of the dicrotic wave relative to the systolic wave with vasodilatation:

WHAT WE DID:
We performed an ethically approved study where we downloaded data from the pulse oximeter whilst 20 women had spinal anaesthesia for their caesarean section. The pulse oximeter waveform was filtered and then fitted to two normal distributions for the systolic and dicrotic waves. The movement of the dicrotic wave relative to the systolic wave was then estimated and related to changes in blood pressure.

RESULTS:
15 out of the 20 women had low blood pressure and we recorded an increase in the distance between the systolic and diastolic waves in 8 of these cases which occurred prior to the lowest blood pressure (see example below):

Conclusions:
• Pulse oximeter waveform analysis shows promise as a means of assessing changes in vasomotor tone during spinal anaesthesia for caesarean section.
• It could be used to guide the management of low blood pressure
• Further work is needed to refine the technique

REFERENCES: