Age-Related and Sex-Related Changes in Perfusion Index in Response to Noxious Electrical Stimulation in Healthy Subjects

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Background

Even though pain is a subjective phenomenon, its objective evaluation in humans is important because subjects requiring pain evaluation may be unable to describe their pain intensity because of decreased awareness or impaired cognitive function. Previous reports indicate that the perfusion index (PI), which is calculated from pulse oximeter waveforms, has some utility in assessing pain. However, age-associated and sex-associated differences in change of PI have hitherto not been evaluated for assessment of pain. Therefore, we aimed to estimate the utility of age-related differences in PI change among healthy volunteers subjected to electrical stimulation.

Methods

We measured PI and pulse rate in 70 healthy volunteers exposed to gradually increasing electrical stimulation. The subjects were classified into four groups, ie, young men, young women, aged men, and aged women. Stimulation was stopped when subjects reached their pain tolerance threshold. The average PI and pulse rate were calculated 10 seconds before and after electrical stimulation and compared across the four groups. Changes in PI and pulse rate were analyzed using the paired t-test.

Results

The PI was significantly decreased in response to pain stimulation in young men ($P<0.0001$), young women ($P=0.0002$), and aged men ($P=0.0158$). However, aged women failed to show significant changes in PI before or after stimulation. The pulse rate was not significantly altered in any of the groups.

Conclusion

PI may be an independent parameter reflecting the perception of noxious stimuli and could be used for objective evaluation of pain perception in healthy volunteers, except when it is used for pain evaluation in elderly women.