Monitoring of propofol in breathing gas

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Monitoring drug concentrations in inspired and expired breathing gas is an established, valuable and convenient tool for the assessment and guidance of anesthesia when volatile anesthetics are used. Determination of volatile anesthetics in breathing gas provides information about the amount of the volatile anesthetic drug in the blood of the patient. However when i.v. anesthetic drugs are administered information about blood concentration is limited. Pharmacokinetic models can provide a prediction of drug concentration and have led to the development of the concept of target controlled infusion (TCI). This approach does not reveal information about possible problems that may occur during drug administration since the amount of the drug in the body of the patient is not measured. In several case reports [1,2] clinical situations where incorrect administration of propofol has led to adverse events have been revealed and discussed.
Recent studies [3,4] describe that low concentrations of propofol (2,6-di-isopropylphenole) can be detected in exhaled breathing gas. A linear correlation of propofol concentrations with propofol concentrations in blood plasma was found in animal studies. This suggests that online monitoring of propofol in breathing gas may provide useful information during i.v. anesthesia. For all studies complex analysis equipment such as gas chromatography mass spectrometers (GC/MS) and soft ionization mass spectrometers operated and maintained by specialized and trained staff have been used.
Continuous real-time monitoring of propofol requires highly sensitive and selective detection technologies that are robust, simple, easy to use and economically feasible in the clinical setting. In an animal study we were able quantify propofol concentrations in breathing gas during i.v. anesthesia using electrochemical sensor technology. Changes in propofol blood concentrations were induced by varying the infusion rates of propofol and the response of the electrochemical sensor system to these changes was studied.
The results of the study indicate that noninvasive monitoring of propofol may become feasible with electrochemical gas sensor technology.

Literature:

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