



Xenon anaesthesia in neurosurgery

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Background

There is the official permission of the Pharmacology Committee of the Ministry of Health of the Russian Federation for the use of the inert gas Xenon (Xe) as inhaled anaesthetic. Xe is known to have several unique beneficial properties, one of them being neuroprotection which could be useful during neurosurgical operations. The aim of this study was to evaluate the clinical efficacy, tolerance and adverse effects of Xe for anaesthesia in neurosurgery.

Methods

Following the approval of local ethics committee Xe was used as a basic anaesthetic in 11 pts. (M=5, F=6; aged 47.4 ± 5.1 ; ASA II-IV) during neurosurgery operations:

brain tumor removal – 4;
ventriculoatrial bypass – 2;
cranioplasty – 2;
haematoma removal – 3.

Mean duration of surgery and anaesthesia was 2.97 ± 1.54 h and 4.09 ± 1.9 h, respectively. Anaesthesia was induced with thiopental and fentanyl and followed by the administration of cisatracurium.

Xe anaesthesia was maintained and controlled using a closed-circuit anaesthesia system (AxeomaTM, Alfa-Impex Oy, Finland) with minimal-flow technique (FiXe 60 vol%). BP (APs and APd), ECG, HR, etCO₂, SatO₂, FiO₂, FiXe and AEP were monitored.

There was a control group of 15 patients (M=8, F=7; aged 45.1 ± 12.6 ; ASA II-IV). Brain tumor removal was performed on these patients with propofol TIVA.



Anaesthesia machine AxeomaTM and monitoring devices

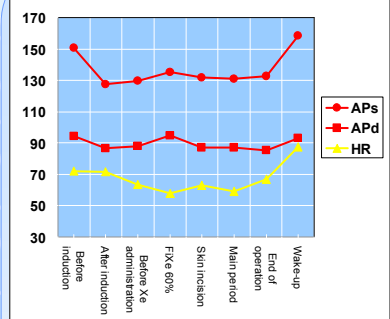
Results

BP increased in all cases of Xe anaesthesia and this BP increase required infusion of a hypotensive drug in 2 pts.

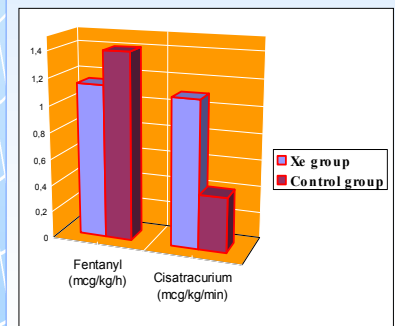
Brain condition after dura mater incision was assessed by surgeons as satisfactory (without swelling and prolapse).

In 2 pts AEP was 45-55, which corresponds to a state of consciousness between superficial anaesthesia and awareness.

The wake-up time was 18.1 ± 5.99 min after the Xe flush-out and at FiXe $14.3 \pm 10.81\%$. Mental status was good, there was no postanaesthesia depression. In the early postoperative period there was shivering in 4 pts., vomiting in 2 and 1 case of laryngospasm. Four patients had a BP increase up to 20% from baseline and tachycardia (hypotensive drug infusion was required) and 1 patient had complication as atrial fibrillation paroxysm.



Haemodynamic during Xe anaesthesia



Fentanyl and Cisatracurium consumption

Conclusion

Use of Xe during neurosurgical operations enables well-controlled anaesthesia without BP suppression, fast recovery and good conditions for surgical intervention. There were certain side effects during the early postoperative period. More investigations are needed for a detailed evaluation of the safety and prospects of Xe anaesthesia during neurosurgery operations and to establish the cause of adverse effects. We believe that AEP monitoring should be used in Xe anaesthesia to prevent intraoperative awareness.

References

1. Homi H.M. et al., Anesthesiology 2003; 99: 876-81.
2. Natale G. et al., Ann N Y Acad Sci. 2006 Aug; 1074: 650-8.