The effects of reverse Trendelenburg position on intracranial pressure cerebral perfusion pressure during craniotomy in patients with cerebral tumours and cerebral aneurysms

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ABSTRACT

During craniotomy intracranial pressure (ICP) is a strong predictor of the occurrence of cerebral swelling after opening of the dura. The purposes of this thesis are as follows: 1) To define an optimal reverse Trendelenburg position (rTp), defined as the position at which the decrease in ICP is maximal, without decreasing cerebral perfusion pressure (CPP) below 60 mmHg, 2) to study the effects of 10° rTp upon ICP and CPP in patients with cerebral aneurysm (SAH), 3) to study the effects of 10° rTp upon ICP and CPP in prone positioned patients, and 4) to study the influence of anaesthesia method upon the effects of rTp upon ICP and CPP and the optimal position. ICP was measured subdurally during craniotomy before opening of dura.

The optimal rTp was investigated in 53 supine positioned, propofol/fentanyl-anaesthetized patients with cerebral tumours. There was considerable individual variation in the optimal position, being neutral position in five patients, 5° rTp in five patients, 10° rTp in ten patients, and 15° rTp in 33 patients. The measurements of ICP and CPP can be obtained within few minutes, and decision concerning optimal position before opening of dura can be drawn immediately after the measurements.

The effects of 10° rTp upon ICP and CPP were studied in supine-positioned patients with cerebral aneurysm. Of 28 patients, 25 experienced a decrease of ICP. CPP was unchanged or increased in 12 patients. In neutral position ICP averaged 2.9 ± 2.6 mmHg in patients with unruptured aneurysm. ICP was significantly higher (9.3 ± 3.8 mmHg) in patients with subarachnoid haemorrhage, 10° rTp decreased ICP significantly, leaving CPP unchanged.

In prone-positioned patients with occipital or cerebellar tumours 10° rTp decreased subdural ICP significantly, while CPP was unchanged.

The effects of rTp upon ICP and CPP were investigated in patients with supratentorial cerebral tumours anaesthetized with either propofol/fentanyl or propofol/remifentanil. A significant fall in ICP during rTp was observed in both groups without significant inter-group differences in the changes in ICP or CPP. The levels of CPP and MABP, however, were significantly lower during propofol/remifentanil anaesthesia. The distribution of optimal position as defined in this study was independent on choice of anaesthesia.

During craniotomy 10° change in rTp effectively reduces ICP without affecting CPP significantly because the fall in ICP and in blood pressure outweigh each other. During rTp the decrease in subdural ICP occurs within one minute and is accompanied by a fall in dural tension. Thus, the risk of cerebral swelling after opening of dura decreases. The choice of anaesthesia does not influence the ICP decreasing effects of rTp.

Further studies are necessary in order to investigate the effects of rTp when combined with hyperventilation, mannitol or indomethacin. The effects of rTp upon ICP and CPP during inhalationanaesthesia (sevoflurane, isoflurane, desflurane) have not been studied.