Effect of diclofenac on cerebral blood flow velocity in patients with supratentorial tumours

S. J. Jones and J. Dinsmore

Department of Anaesthesia, St George’s Hospital, Blackshaw Road, London SW17 0NE, UK

*Corresponding author

Background. The aim of this investigation was to determine the effects of diclofenac on cerebral blood flow. Middle cerebral artery blood flow velocity was measured in nine patients with supratentorial tumours.

Methods. Using a transcranial Doppler ultrasound, we measured the baseline mean and systolic cerebral blood flow velocity. Measurements were repeated following administration of diclofenac 75 mg i.v.

Results. There was no significant change in cerebral blood flow velocity. All other physiological variables remained constant.

Conclusion. Diclofenac does not cause a significant change in cerebral blood flow velocity in patients with supratentorial tumours.

Keywords: analgesics, anti-inflammatory, non-steroidal, diclofenac; brain, cerebral blood flow; measurement techniques, transcranial Doppler

Accepted for publication: June 17, 2002

The non-steroidal anti-inflammatory drug (NSAID) diclofenac is used as a perioperative analgesic in our neurosurgical unit for awake craniotomy and supratentorial tumour resections. Indomethacin, another NSAID, is known to significantly decrease cerebral blood flow (CBF) and intracranial pressure without changing cerebral metabolic rate. Animal studies using diclofenac show no change in CBF but this has not been studied in man. Major changes in cerebral physiology with drugs such as indomethacin have significant clinical implications in neuroanaesthesia and it is important that the cerebral effects of all pharmacological agents are known. The aim of our investigation was to determine the effect of diclofenac on CBF velocity (CBFV) in patients with supratentorial pathology.

Methods and results

After obtaining approval from the Hospital Ethics Committee and written, informed consent, nine patients undergoing elective supratentorial neurosurgery were recruited. Patients were excluded if they had asthma, renal impairment, peptic ulcer disease, bleeding diathesis or had ingested NSAIDs within 24 h. No patient had signs of raised intracranial pressure.

The study was performed in the anaesthetic room before induction of anaesthesia. Patients were not premedicated and were kept in the supine position throughout the study period, with the head resting on a pillow. I.V. and arterial cannulae were inserted under local anaesthesia. Monitors included ECG, continuous arterial pressure, arterial blood gas sampling and axillary temperature. CBFV was monitored continuously on the ipsilateral side of the intracerebral pathology. The M1 segment of the middle cerebral artery was insonated through the temporal window using a 2 MHz transcranial Doppler (TCD) ultrasound probe (Pioneer EME TCD VER 2.10, Eden Medical Electronics, Überlingen, Germany). The TCD probe was fixed in position to maintain a constant angle of insonation throughout the study. Confirmation of the middle cerebral artery was achieved by increasing sonation depth to visualization of the bidirectional flow pattern typical of the bifurcation of the internal carotid artery to the middle cerebral and anterior cerebral arteries. Insonation depth was then decreased to the point of maximum signal intensity (45–55 mm depth). The TCD frequency spectra, converted into flow velocity (cm s⁻¹), were calculated automatically by the TCD over 4–5 consecutive cardiac cycles.
Changes in cerebral blood flow (CBF) have been found to be indicative of cerebral haemodynamics but this has not been confirmed in humans, or in this patient population. The results of this study demonstrate that diclofenac does not cause significant changes in CBFV. We compared mean and systolic CBFV before and after the administration of diclofenac in patients with supratentorial pathology. Other physiological parameters that might have affected CBF remained constant. The patients were awake during the experiment and received no pharmacological agents other than diclofenac in normal saline 50 ml, thus avoiding potential alterations of CBF or intracerebral vessel diameter.

Indomethacin, another NSAID, is a potent cerebral vasoconstrictor. It decreases CBF by up to 40% without a change in cerebral metabolic rate, similar to the effects of hypocapnia. However, this effect appears to be unique among the NSAIDs. Its mechanism of cerebral vasoconstriction is still uncertain, but seems to result from mechanisms other than prostaglandin inhibition. The role of NSAIDs in the management of cerebral injury has also been investigated. NSAIDs may improve collateral circulation in ischaemic brain and prevent cerebral vasospasm following subarachnoid haemorrhage. Indomethacin has been used to control intracranial pressure and improve operating conditions in patients with cerebral tumours.

We chose to study patients with intracerebral pathology as this may alter CBF and its regulation, and for the practical reason that this reflects our clinical patient population likely to receive diclofenac. As our numbers are small, we may have overlooked a significant response to diclofenac with a given tumour type, although no trend was seen.

Absolute CBF cannot be inferred from measurements of CBFV because the diameter of the insonated vessel segment is unknown. Despite this, the use of the TCD to measure CBFV has been shown to provide a good correlation between changes in flow velocity and cerebral blood flow as long as measurement conditions such as insonation angle and depth remain constant.

In conclusion, we have shown that there is no significant change in CBFV after the administration of diclofenac in a small group of patients with supratentorial tumours.

**Comments**

We find that diclofenac provides useful perioperative analgesia in a select group of neurosurgical patients but we were unsure of its effects on cerebral physiology. Animal studies have shown that diclofenac has no effect on cerebral haemodynamics but this had not been confirmed in humans, or in this patient population. The results of this study demonstrate that diclofenac does not cause significant changes in CBFV. We compared mean and systolic CBFV before and after the administration of diclofenac in patients with supratentorial pathology. Other physiological parameters that might have affected CBF remained constant. The patients were awake during the experiment and received no pharmacological agents other than diclofenac in normal saline 50 ml, thus avoiding potential alterations of CBF or intracerebral vessel diameter.

Indomethacin, another NSAID, is a potent cerebral vasoconstrictor. It decreases CBF by up to 40% without a change in cerebral metabolic rate, similar to the effects of hypocapnia. However, this effect appears to be unique among the NSAIDs. Its mechanism of cerebral vasoconstriction is still uncertain, but seems to result from mechanisms other than prostaglandin inhibition. The role of NSAIDs in the management of cerebral injury has also been investigated. NSAIDs may improve collateral circulation in ischaemic brain and prevent cerebral vasospasm following subarachnoid haemorrhage. Indomethacin has been used to control intracranial pressure and improve operating conditions in patients with cerebral tumours.

We chose to study patients with intracerebral pathology as this may alter CBF and its regulation, and for the practical reason that this reflects our clinical patient population likely to receive diclofenac. As our numbers are small, we may have overlooked a significant response to diclofenac with a given tumour type, although no trend was seen.

Absolute CBF cannot be inferred from measurements of CBFV because the diameter of the insonated vessel segment is unknown. Despite this, the use of the TCD to measure CBFV has been shown to provide a good correlation between changes in flow velocity and cerebral blood flow as long as measurement conditions such as insonation angle and depth remain constant.

In conclusion, we have shown that there is no significant change in CBFV after the administration of diclofenac in a small group of patients with supratentorial tumours.


© The Board of Management and Trustees of the British Journal of Anaesthesia 2002