

TITLE: POSTOPERATIVE HYPERTENSION FOLLOWING INTRACRANIAL ANEURYSM CLIPPING

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Introduction. Postoperative hypertension occurs commonly (19-29% incidence) after carotid endarterectomy.¹⁻³ While neuroanesthesiologists generally view patients undergoing clipping of intracranial aneurysms to also be at risk for postop hypertension, the occurrence of such hypertension is not documented. We reviewed charts of patients undergoing clipping of cerebral aneurysms and ENT procedures of similar duration to determine if the incidence of postoperative hypertension in cerebral aneurysm patients is increased over patients undergoing general anesthesia for head and neck surgery.

Methods. We reviewed patient charts from all patients undergoing intracranial aneurysm clipping (60 procedures in 57 patients) and randomly selected patients (n = 60) undergoing ENT procedures of similar duration (radical neck surgery and repair of complex facial fractures) at our institution (HMC) between 1/85 and 10/86. Patients with significant head, spinal cord, or carotid artery injury were excluded from the ENT group. Twenty percent of the cerebral aneurysms were unruptured, 45% were clipped within 36 hrs of subarachnoid hemorrhage (SAH), 20% between 36-72 hrs, and 15% greater than 72 hrs after SAH. The following Hunt's grade SAH were represented: I:2, II:16, III:14, IV:13, V:3. All patients received general anesthesia with a volatile anesthetic (mostly isoflurane), narcotic, plus/minus nitrous oxide. Sodium nitroprusside (SNP) was used to lower BP intraoperatively during aneurysm clipping in 68% of the patients. History of preop hypertension, preoperative drugs, general anesthetic agents, and postop complications and treatments were documented. Vasodilators (SNP primarily) and/or narcotics were used to treat blood pressure elevations (greater than 160/90 mmHg) as deemed necessary by clinical judgment. Systolic and diastolic blood pressures (BP) obtained from the chart were noted preop, intraop, and postop: 0-1 hrs, 1-3 hrs, 3-24 hrs, and 24-48 hrs. BP determined by auscultation were used if a discrepancy was noted between direct arterial pressures and auscultation. Mean arterial pressure (MAP) was calculated as [(systolic BP-diastolic BP)/3] + diastolic BP. Hypertension was defined as 160/90 mmHg or MAP > 113 mmHg. The incidence of hypertension was compared by a Chi Square test. MAP were compared by a two-factor mixed design ANOVA, with differences further assessed by the Duncan Multiple Range test. Means ± SE are presented in Results. p < .05 was deemed significant.

Results. Intracranial aneurysm and ENT patients did not differ significantly in their preop incidence of hypertension or preop MAP (see Tables 1 and 2). During the first hour postop, MAP was significantly increased compared to preop in both groups (see Table 1, p < .01). Vasodilators, in addition to narcotics, were used to control MAP in almost half of the postop cerebral aneurysms (0-1 hr: 43%, 1-3 hrs: 43%, 3-24 hrs: 40%, 24-48 hrs: 32%), in contrast to ENT patients, who only received narcotics. In spite of the attempt to control BP, postop MAP was higher following cerebral aneurysm clipping than ENT procedures (p < .01) and was longer in duration (see Table 1). The incidence of hypertension

(with or without vasodilators) was greater following cerebral aneurysm clipping, especially in the 3-24 hr and 24-48 hr periods (p < .01) (see Table 2). The incidence of hypertension was not different in ruptured vs. unruptured cerebral aneurysms.

Discussion. The present study demonstrates that hypertension (defined by BP greater than 160/90 mmHg) occurs postoperatively in over a third of intracranial aneurysm clippings, despite attempts to control BP with vasodilators. Although postop hypertension is common in patients undergoing general anesthesia for ENT procedures, it is less severe and of shorter duration. The incidence and severity of the postop hypertension following intracranial aneurysm clipping is similar to that reported to occur following carotid endarterectomy.¹⁻³ We conclude that careful attention to blood pressure is required after intracranial aneurysm clipping.

References.

1. Bove EL et al: Hypotension and hypertension as consequences of baroreceptor dysfunction following carotid endarterectomy. *Surgery* 86:633-637, 1979
2. Towne JB, Bernhard WM: The relationship of postoperative hypertension to complications following carotid endarterectomy. *Surgery* 88:575-580, 1980
3. Asiddao CB et al: Factors associated with perioperative complications during carotid endarterectomy. *Anesth Analg* 61:631-637, 1982

Table 1. Mean Blood Pressure (mean ± SE) in Patients Undergoing ENT Procedures vs. Cerebral Aneurysm Clipping

| Group | Preop | Postop | | | |
|----------|-------|---------|---------|----------|-----------|
| | | 0-1 hr | 1-3 hrs | 3-24 hrs | 24-48 hrs |
| ENT | 100±2 | 106±2† | 104±2† | 99±1 | 97±2 |
| Aneurysm | 104±2 | 112±2†* | 109±2†* | 106±2* | 104±2* |

† means significantly different compared to preop MAP
* means significantly different compared to ENT group

Table 2. Number (Percent) ENT Patients with Hypertension vs. Cerebral Aneurysm Patients with Hypertension and Normotension with and without Vasodilator Treatment.

| | ENT(n=60) | | Cerebral Aneurysm(n=60) | | | |
|---------------|-------------|---------|-------------------------|---------|---------|--|
| | HTN(all NV) | HTN(V) | HTN(NV) | NTN(V) | NTN(NV) | |
| Preop | 11(18%) | 8(13%) | 11(18%) | 2(3%) | 39(65%) | |
| Postop | | | | | | |
| 0-1 h | 18(30%) | 18(30%) | 11(18%) | 8(13%) | 23(38%) | |
| 1-3 h | 14(23%) | 12(20%) | 10(17%) | 14(23%) | 24(40%) | |
| 3-24 h | 6(10%) | 12(20%) | 7(12%) | 12(20%) | 29(48%) | |
| 24-48 h | 5(8%) | 10(17%) | 8(13%) | 9(15%) | 33(55%) | |

HTN = hypertension, NTN = normotension, V = vasodilator used to control BP, NV = no vasodilator