Case-Control Study of Patients at Risk of Medical Complications after Elective Craniotomy

Judith Anthofer[1], Megan Wester[1], Florian Zeman[2], Alexander Brawanski[1], Karl-Michael Schebesch[1]

OBJECTIVE: **Medical complications severely impair recovery of neurosurgical patients after craniotomy. The purpose of this study was to identify patients at risk of peri- and postoperative medical complications. Therefore, we present a large population of patients with different medical complications after elective craniotomy.**

METHODS: **We retrospectively screened all patients who had been consecutively treated at our department between June 2009 and June 2014. Patients with any postoperative thromboembolic complication or pulmonary or systemic infection were compared with a control group without any medical complication. Peri- and postoperative complications were statistically analyzed with regard to their association with age, sex, comorbidity, indication for craniotomy, duration of surgery, surgical position, type of anesthesia, and previous craniotomy by means of logistic regression models.**

RESULTS: **Of 1800 patients screened, 133 patients (67 women and 66 men aged between 14 and 85 years) had developed medical complications (overall morbidity, 7.4%). We found statistically significant correlations between thromboembolic events and meningioma, previous craniotomy, duration of surgery, and hypertension ($P = 0.002$, $P = 0.032$, $P < 0.001$, and $P < 0.001$, respectively). Severe infection was associated with age, duration of surgery, and craniopharyngioma and pituitary adenoma ($P = 0.012$, $P = 0.004$, and $P = 0.029$, respectively). Prolonged stay in the intensive care unit was associated with increased duration of surgery and hypertension ($P = 0.002$ and $P < 0.001$).**

CONCLUSIONS: **In this study, we identified predictors that help characterize patients at risk of medical complications after elective neurosurgical procedures. These correlations should be taken into account when advising patients on craniotomy.**

INTRODUCTION

Apart from neurologic deficits or surgical complications, medical complications also severely impair recovery of neurosurgical patients after craniotomy. Several projects and databases have been developed to improve the prevention of complications in patient care[1-3] that serve as valuable sources for extensive research. One aim of these projects is the prevention of venous thromboembolism (VTE),[1,4] but less attention has been given to other medical complications. Here, we present a large population of patients with different medical complications after elective craniotomy. We show the most frequent postoperative medical complications and describe risk factors that contribute to the development of such complications.

METHODS

Patients

This case-control study included 1800 patients who had presented at our neurosurgical department between June 2009 and June 2014. The objective of this study was to evaluate prognostic factors for peri- and postoperative medical complications by means of patients with postoperative medical complications as cases and complication-free patients as controls. Therefore, we

Key words
- Complication
- Craniotomy
- High-risk patients
- Postoperative ICU stay
- Postoperative medical complication

Abbreviations and Acronyms
ASA: American Society of Anesthesiologists
DVT: Deep venous thrombosis
ICU: Intensive care unit
PE: Pulmonary embolism
VTE: Venous thromboembolism

From the [1]Department of Neurosurgery and [2]Center for Clinical Studies, University Medical Center Regensburg, Regensburg, Bavaria, Germany

To whom correspondence should be addressed: Judith Anthofer, M.D. [E-mail: Judith.Anthofer@klinik.uni-regensburg.de]

Citation: World Neurosurg. (2016) 91:58-65.
http://dx.doi.org/10.1016/j.wneu.2016.03.087

Journal homepage: www.WORLDNEUROSURGERY.org

Available online: www.sciencedirect.com

Table 1. Demographic Data and Analyzed Variables of 133 Patients with Internal Complications and the Control Group without Any Internal Complications (n = 163)

Characteristics	With Medical Complications (n = 133)	Control Group (n = 163)	*P* Value
Sex, number (%)			
Women	67 (49.6)	73 (44.8)	
Men	66 (50.4)	90 (55.2)	0.338
Age (years), mean (standard deviation), range	63 (15), 14–85	51 (19), 0.3–87	< 0.001
Comorbidities (categories), number (%)			
Hypertension	69 (51.9)	40 (24.5)	< 0.001
Cardiac disease (myocardial infarction, coronary heart disease, arrhythmia)	38 (28.6)	22 (13.5)	0.001
Diabetes mellitus, hypercholesterolemia	19 (14.4)	14 (8.6)	0.121
Coagulopathy, iatrogenic anticoagulation	12 (9.0)	12 (7.4)	0.603
Pulmonary disease	9 (6.8)	14 (8.6)	0.560
Others*	22 (16.5)	12 (7.4)	0.034
No comorbidities	37 (27.8)	97 (59.5)	< 0.001
Indication for craniotomy, number (%)			
Tumor	83 (62.4)	95 (58.3)	0.471
Glioblastoma	22 (16.5)	27 (16.6)	
Anaplastic astrocytoma	4 (3.0)	21 (12.9)	
Low-grade glioma	1 (0.8)	9 (5.5)	
Meningioma	33 (24.8)	25 (15.3)	
Craniopharyngioma and pituitary adenoma	4 (3.0)	2 (1.2)	
Ependymoma	6 (4.5)	2 (1.2)	
Vestibular schwannoma	6 (4.5)	0 (0)	
Lymphoma	3 (2.3)	3 (1.8)	
Others†	4 (3.0)	6 (3.7)	
Metastasis	18 (13.5)	19 (11.7)	0.627
Vascular malformation	12 (9.0)	11 (6.7)	0.467
Reconstructive surgery	14 (10.5)	21 (12.9)	0.532
Others‡	6 (4.5)	17 (10.4)	0.058
Previous craniotomy, number (%)	42 (31.6)	82 (50.3)	0.001
Localization of craniotomy, number (%)			
Supratentorial	105 (78.9)	140 (85.9)	
Infratentorial	28 (21.1)	23 (14.1)	0.116
Intraoperative position, number (%)			
Supine	104 (78.2)	137 (84.0)	
Prone	28 (21.1)	25 (15.3)	0.435
Lateral position	1 (0.8)	1 (0.6)	
Duration of surgery (minutes), median (range)	210 (72–607)	172 (39–599)	< 0.001
Type of anesthesia, number (%)			
Total intravenous anesthesia	5 (3.8)	20 (12.3)	
Total intravenous anesthesia + volatile anesthetic	117 (88)	121 (74.2)	0.005

Continues