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Recovery of Third Nerve Palsy Following Surgical Clipping of Posterior Communicating Artery Aneurysms

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Key words
- Aneurysm
- Oculomotor nerve
- Posterior communicating artery
- Surgical clipping
- Third cranial nerve dysfunction

Abbreviations and Acronyms
PComA: Posterior communicating artery
SAH: Subarachnoid hemorrhage
CN III: Third cranial nerve
GOS: Glasgow Outcome Score
WFNS: World Federation of Neurologic Surgeons


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BACKGROUND: **The objective of the study was to identify the predictors of improved third cranial nerve (CN III) function in patients who underwent surgical clipping for posterior communicating artery (PComA) aneurysms with varying degrees of CN III palsy at presentation.**

METHODS: **We retrospectively evaluated the outcome of the CN III function in a series of 26 patients with CN III dysfunction due to PComA aneurysms that were treated by surgical clipping.**

RESULTS: **CN III palsy was complete in 18 patients (69%) and partial in 8 patients (31%) at the time of admission. In 15 patients (58%), there was total improvement of CN III function. Partial improvement was noted in 5 patients (19%). Overall improvement (partial and total) of CN III function was observed in 20 (77%) of the 26 patients. The improvement in CN III function following early surgery (0-3 days) was 81.3% when compared to 75% when surgery was performed after 3 days. In univariate analysis, the only variable showing significant association with total improvement of CN III function was type of third nerve palsy at admission (complete vs partial) (*P*=.004). There was no statistical significant association between early surgery and improvement of CN III function (*P*=.722). In multivariate analysis, among all the factors, the type of third nerve palsy at presentation (complete and partial) was the significant predictor of the improved CN III function (*P*=.0038).**

CONCLUSION: **Surgical clipping of the PComA aneurysm in patients with CN III palsy results in improvement of the CN III function in the majority of patients. The type of the CN III palsy at admission (complete/partial) is a significant predictor of complete improvement in CN III function.**

INTRODUCTION

Oculomotor nerve (ie, third cranial nerve [CN III]) dysfunction is one of the clinical presentations associated with posterior

Table 1. Duration of Third Nerve Dysfunction (n=24)

Duration (days)	*n*
0–3	16
4–6	4
7–13	2
14–30	2

communicating artery (PComA) aneurysms. Direct mechanical compression or irritation may result in the dysfunction of CN III. However, recovery after surgical clipping is documented in case reports and small series (1, 3, 5, 8). The number of patients in surgical series is small, and the results are variable with respect to complete and partial recovery. Endovascular coiling has been shown to improve CN III function (1, 2, 3, 11); however, there are concerns that mass effect from the coils may compromise its function. It is still unclear which treatment modality (i.e., endovascular or surgery) is to be recommended to a patient with CN III dysfunction due to PComA aneurysm. In this paper, we study the outcome of CN III palsy following surgical clipping and attempt to determine the predictors of complete recovery of CN III function.

MATERIAL AND METHODS

The study was approved by the institutional review board of the Louisiana State University Health Sciences Center. Between 1992 and 2009, 165 patents with PComA aneurysms were treated with surgical clipping at our institution. Of the 165 patients, 32 were identified with CN III dysfunction. Patient hospital medical records, operative reports, preoperative and postoperative angiographic reports, discharge summaries, follow-up records of ophthalmic examination, and follow-up angiographic reports were reviewed retrospectively. Of the 32 patients, we could retrieve the third nerve status following surgery in 26 patients by carefully reviewing the follow-up records. Patients were also interviewed over the telephone about ocular symptoms and to evaluate the clinical outcome. The following parameters were assessed: age, sex, aneurysm size, rupture status, WFNS grade at admission, degree of CN III palsy, interval between CN III dysfunction and surgery, outcome at discharge, and CN III status during the follow-up. All the relevant data were available for 26 of the 32 patients. All the patients were followed up at 3 months, 6 months, and annually thereafter. The degree of third nerve palsy and the extent of recovery were assessed according the criteria proposed by Chen et al. (3).

Statistical Analysis

Pearson chi-square was used to study the association between variables and complete recovery. Multiple regression analysis was used to identify the predictors of complete recovery. SPSS software (SPSS Inc, Chicago, Illinois), version 13.0, was used for analysis. The variables that were included in the model were age, sex, complete vs partial CN III palsy at admission, early surgery (0-3 days) vs delayed surgery (>3 days), WFNS grade, size (large vs small), and hematoma (subdural hematoma or parenchymal).

RESULTS

A total of 26 patients were included in this study. Of the 26 patients, 21 were women and 5 were men. The mean age of the patients was 53 years, and 21 patients had subarachnoid hemorrhage (SAH) at the time of admission. Majority of the patients had WFNS Grade-1 SAH (62%) whereas 4 patients (19%) had WFNS Grade 2, 2 (9.5%) had WFNS Grade 3, and 2 (9.5%) had WFNS Grade 4.

The aneurysm was large (>10 mm) in 17 patients (65%) and small (<10 mm) in 9 patients (35%). CN III palsy was complete in 18 (69%) patients and partial in 8 (31%) patients. Postoperative angiogram revealed complete occlusion in all the patients. At the time of discharge, clinical outcome was good (Glasgow Outcome Score [GOS]=5 and 4) in 22 (85%) patients. Mean follow-up duration was 32 months.

We stratified the interval between the onset of third nerve dysfunction and surgical intervention into four groups (Table 1). The interval between the onset of third nerve dysfunction and surgical intervention was 0 to 3 days in 16 patients, 4 to 6 days in 4 patients, 7 to 13 days in 2 patients, and 14 to 30 days in 2 patients. In two patients, we could not get adequate information regarding the onset of third nerve dysfunction.

In 15 (58%) patients, there was total improvement of CN III function. Partial improvement was noted in 5 patients (19%). In 6 patients (23%), no change was noted. All the 8 patients with partial CN III palsy at presentation had total recovery. Of the 18 patients with complete CN III palsy, total improvement was observed in 7 patients, partial improvement was seen in 5 patients, and 6 patients had no improvement. Overall improvement (partial and total) of CN III function was observed in 20 patients (77%), and no change was noted in 6 cases (23%).

Univariate Analysis

In univariate analysis, the only variable showing significant association with total improvement of CN III function following surgical clipping was type of third nerve palsy at admission (complete vs partial; $P=.004$, χ^2). All the eight patients with partial CN III had complete recovery. Only seven patients with complete CN III had total recovery.

The improvement in CN III function following early surgery (0 to 3 days) was 81.3%, as compared to 75% when surgery was performed after 3 days (Table 2). There was no statistically significant association

Table 2. Comparison of Improvement in Third Nerve Function When Surgical Clipping Was Performed Early (0–3 Days) and Late (>3 Days)

		Improvement of Third Nerve Function		
		Yes	No	Total
Early surgery (0–3 days)	Yes	13	3	16
	No	6	2	8
Total		19	5	24