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Posterior Communicating Aneurysm with Oculomotor Nerve Palsy: Clinical Outcome After Aneurysm Clipping

Okülomotor Sinir Paralizisiyle Posterior Komünikan Anevrizma: Anevrizma Kliplenmesinden Sonra Klinik Sonuç

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ABSTRACT

AIM: One of the clinical presentations of intracranial aneurysm is unilateral oculomotor nerve palsy (ONP). The most common location is the posterior communicating artery. Surgical clipping and/or endovascular coiling of the aneurysm are the treatments. The aim of this study was to identify the factors that influence the postoperative recovery of patients who have posterior communicating aneurysm with ONP.

MATERIAL and METHODS: We included 13 patients diagnosed at our hospital from 1993 to 2008 with posterior communicating aneurysm with ONP. Ten patients underwent craniotomy to clip the aneurysm; 3 patients refused surgery.

RESULTS: Five (50%) patients presented with periorbital pain. Seven (70%) patients had complete ONP recovery with a median recovery time of 58 days. We found that the first recovered component of ONP after clipping was the parasympathetic fibers with a mean recovery time of 4.4 days. Nine patients had a good recovery outcome; one patient died from postoperative vasospasm. There was no significant linear trend in complete recovery rate across palsy symptom periods. However, the palsy symptom period was significant correlated with recovery time.

CONCLUSION: Early decompression of the posterior communicating aneurysm yielded satisfactory recovery and ONP can be reversible. In our patients, the first component of oculomotor function to recover was the parasympathetic fibers.

KEYWORDS: Intracranial aneurysm, Posterior communicating aneurysm, Oculomotor nerve palsy, Aneurysm clipping

ÖZ

AMAÇ: İntrakraniyal anevrizmanın klinik sunumlarından biri unilateral okülomotor sinir paralizisidir (ONP). En sık görüldüğü konum posterior komünikan arterdir. Tedavi olarak, anevrizmanın cerrahi kliplenmesi ve/veya endovasküler koilleme kullanılır. Bu çalışmanın amacı, ONP ile birlikte posterior komünikan anevrizması olan hastalarda postoperatif iyileşmeyi etkileyen faktörleri tanımlamaktı.

YÖNTEM ve GEREÇLER: Hastanemizde 1993 ile 2008 yılları arasında ONP ile posterior komünikan arter anevrizması tanısı konmuş 13 hastayı çalışmaya dahil ettik. On hastada anevrizmayı kliplemek için kraniyotomi yapıldı; 3 hasta cerrahiyi reddetti.

BULGULAR: Beş (%50) hasta periorbital ağrıyla geldi. Yedi (%70) hasta medyan 58 günlük iyileşme süresiyle ONP'den tam olarak iyileşti. Kliplemeden sonra okülomotor sinir paralizisinde ilk iyileşen kısmın 4,4 günlük bir ortalama iyileşme süresiyle parasempatik lifler olduğunu gördük. Dokuz hasta iyi bir şekilde iyileşti; bir hasta postoperatif vazospazm nedeniyle kaybedildi. Paralizi dönemleri arasında tam iyileşme oranı açısından önemli bir lineer trend yoktu. Ancak paralizi belirtileri dönemi iyileşme süresiyle önemli korelasyon gösterdi.

SONUÇ: Posterior komünikan anevrizmanın erken dekompresyonu tatminkar iyileşme sağladı ve ONP geri çevrilebildi. Hastalarımızda okülomotor işlevin ilk iyileşen bileşeni parasempatik liflerdi.

ANAHTAR SÖZCÜKLER: İntrakraniyal anevrizma, Posterior komünikan anevrizma, Okülomotor sinir paralizisi, Anevrizma klipleme

INTRODUCTION

Oculomotor nerve palsy (ONP) is a well-known clinical presentation associated with intracranial aneurysms. Posterior communicating aneurysms have been found to be the most common intracranial aneurysms, followed by internal carotid cavernous sinus aneurysms and aneurysms of bifurcation, basilar artery apex aneurysms, and other aneurysms, such as rare anterior communicating aneurysms and aneurysms of the anterior cerebral and middle cerebral arteries (2,5,6,12). Compression, either by enlargement of the aneurysm or pulsation of the aneurysm, is considered the main cause in patients without subarachnoid hemorrhage. There have been some cases series reported in which ONP was resolved after endovascular coiling (4,5,7,16) and some that reported no significant difference in clinical outcome between clipping and coiling (17). Surgical clipping of the aneurysm to decompress the oculomotor nerve remains the mainstay treatment. This study was conducted to investigate the postoperative recovery of patients who had posterior communicating aneurysm with ONP and the factors that influence recovery.

MATERIAL and METHODS

We retrospectively reviewed our patients diagnosed with posterior communicating aneurysm from 1993 to 2008. There were 99 patients with 104 aneurysms. Only 13 (13.1%) patients had the clinical presentation of ONP. Three patients refused surgery and the other 10 patients underwent craniotomy under microscopy to clip the aneurysm.

Complete preoperative ONP was defined as pupil dysfunction without light reflex, ptosis, diplopia, and total extraocular muscle limitation. Otherwise, it was defined as incomplete. Complete recovery of ONP was defined as complete resolution of ptosis and complete recovery of pupil reaction without diplopia and with a full range of movement in all directions of gaze.

Statistical Analysis

Continuous variables were presented as mean±SD or median with interquartile range (25th and 75th percentiles), depending on normality of distribution. Categorical variables were represented by counts and percentages. The difference in complete recovery rates between complete and incomplete ONP patients was compared by Fisher's exact test. The linear trend in complete recovery rates across different symptoms periods was analyzed with the Cochran-Armitage trend test. The linear relationship between the time period of palsy symptoms and ONP recovery time was analyzed using Spearman's rank correlation coefficient. The statistical analyses were performed with SAS software version 9.2 (SAS Institute Inc., Cary, NC), and two-tailed $P < 0.05$ indicated statistical significance.

RESULTS

The characteristics of the 10 patients who underwent surgery are summarized in Table I. There were 8 female patients and 2 male patients, their mean age was 59.9 years. Three patients had associated subarachnoid hemorrhage; the other 7 did not. Five (50%) patients presented with periorbital pain. Nine patients had photophobia, ptosis, and double vision. Only one patient had the presentation of anisocoria without ptosis and diplopia. Two patients had complete ONP and 8 had incomplete ONP. The median duration of the palsy symptoms period was 3 days (interquartile range: 2-7 days). Nine patients had a Glasgow Outcome Scale score indicating good recovery and only one patient died of severe vasospasm. The first recovered component of ONP was the parasympathetic fibers, which on average resulted in complete isocoria 4.4±2.8 day after surgery. Seven patients recovered completely with a median recovery time of 58 days (interquartile range: 43-76 days). One patient was lost follow-up. There was one patient who showed incomplete recovery after clipping of the aneurysm at 7 months follow-up. This patient had complete oculomotor palsy before the operation and the symptoms lasted for 19 days.

The complete recovery rate was 50% and 75% among complete and incomplete ONP patients, respectively. However, the difference in complete recovery rates between the two groups was not significant (Table II). There was also no significant linear trend in complete recovery rate across the time period of palsy symptoms. However, the time period of palsy symptoms was significantly correlated with recovery time (Spearman's rank correlation coefficient, $r=0.764$, $P=0.046$). This indicated that the longer palsy symptoms lasted before the operation, the more extended was the duration of recovery.

DISCUSSION

Spontaneous unilateral ONP has been found to be most common presentation related to intracranial aneurysms (13), and the posterior communicating artery has been found to be the most common location (2,5,6,12). The incidence of ONP in patients with posterior communicating aneurysm has been reported to vary from 9% to 50% (4,18,19). In the present study, among a total of 99 patients with 103 aneurysms, 13 (13.1%) patients had unilateral oculomotor palsy. The mechanisms of ONP are direct compression by the enlarging aneurysm or pulsation of the intracranial aneurysm in non-subarachnoid hemorrhage patients.

Treatment of intracranial aneurysms should not be delayed even if patients do not have subarachnoid hemorrhage. Either clipping or coiling is the current treatment for these aneurysms. There have been some reports in the literature that endovascular coiling of the posterior communicating aneurysm provided a good result with regard to ONP recovery (9,15). Bulsara et al. (3) reported that coiling resulted in some degree of ONP recovery in 65% patients but Stiebel Kalish et al (16) reported that most of the patients' symptoms improved although complete resolution of ONP did not occur. Some studies that compared coiling and clipping (1,17) showed no difference in results between these two treatments. Chen et al (4) reported that 86% vs 33% of patients had complete resolution of ONP after clipping and coiling, respectively. Our study showed a 70% complete recovery rate which is similar to recovery rates in previous studies (4,17,19). Therefore, patients who present with ONP should undergo surgical decompression if they can tolerate the procedure.

Aspiration of the aneurysm in order to decompress the oculomotor nerve is another interesting treatment strategy. After clipping the neck of aneurysm, it will shrink and thrombose. Also, a previous study indicated that there is no relationship between ONP recovery and nerve decompression (11).

Ipsilateral periorbital pain may be another warning sign of intracranial aneurysm. It may indicate impending aneurysmal

Table I: Summary of Patients' Characteristics (n=10)

Demographic characteristics	
Age, year	59.9±10.6
Gender, n (%)	
Female	8 (80.0)
Male	2 (20.0)
Pre-operative	
Pcom location, n (%)	
Left	8 (80.0)
Right	2 (20.0)
ONP, n (%)	
Complete	2 (20.0)
Incomplete	8 (80.0)
PP, n (%)	
No	5 (50.0)
Yes	5 (50.0)
SAH, n (%)	
No	7 (70.0)
Yes	3 (30.0)
Symptoms period, day*	3 (2-7)
Post-operative	
Hospital stay, day*	12 (9-16)
GOS, n (%)	
Death	1 (10.0)
Good Recovery	9 (90.0)
Start to recover day (pupil), day†	4.4±2.8
Complete recovery of ONP, n (%)†	
No	2 (22.2)
Yes	7 (77.8)
Recovery ONP period, day*‡	58 (43-76)

ONP: *oculomotor nerve palsy; PP: Periorbital pain;* ***SAH:*** *subarachnoid hemorrhage;* ***GOS:*** *Glasgow Outcome Scale.*
*******Non-normally distributed continuous variables were summarized by median and interquartile range (25th and 75th percentiles).*
†n=9; ‡n=7.

rupture (14). Some studies in the literature have reported that there are different degrees of retro-orbital pain, ipsilateral headache, and orbital pain in these kinds of patients. The mechanism of the pain was unclear until Lanzino et al. (11) found that data from human autopsy material showed evidence of sensory ganglion cells within the rootlets of the oculomotor nerve. These fibers come from the ophthalmic division of the fifth nerve and join the third nerve at the level of the lateral wall of the cavernous sinus.

Age, aneurysm size, and presence of subarachnoid hemorrhage have been found to have no effect on ONP recovery (17,19). Only time of operation after the onset of symptoms and the severity of ONP were reported to be important in ONP recovery. Long-term nerve compression results in neuronal injury and neural degeneration affecting postoperative recovery. Several studies found that oculomotor palsy is irreversible even after decompression if the symptoms lasted more than 4 weeks. There was satisfactory recovery if the treatment was performed within 2 weeks (12). Kyriakides et al (10) reported that most of the patients operated on in the first week had a complete recovery and they also found a statistical correlation between incomplete palsies and good postoperative recovery.

The clinical course of ONP recovery in patients after clipping is quite constant according to several reports. The recovery of oculomotor function started with the levator palpebrae muscle and was followed by the medial rectus muscle, but the function of parasympathetic fibers, and elevation and depression of the ocular blub is often delayed and not constant (5,8,17,19). However, in the present study, we observed that our patients first had complete recovery of parasympathetic fibers with a mean time after surgery of 4.4 days. The parasympathetic fibers were located at the outside of the oculomotor nerve. Rapid decompression of the oculomotor nerve in our patient group a median of 3 days (interquartile range 2-7 days) after surgery may have led to rapid recovery of the parasympathetic fibers.

Table II: The Association Between ONP, Symptoms Period, and Complete Recovery

	Complete Recovery		
	No, n (%)	**Yes, n (%)**	***p* value**
ONP			1.000†
Complete	1 (50.0)	1 (50.0)	
Incomplete	2 (25.0)	6 (75.0)	
Symptoms period, day¶			0.373‡
<3	1 (33.3)	2 (66.7)	
3~6	2 (50.0)	2 (50.0)	
7+	0 (0.0)	3 (100.0)	

ONP: *oculomotor nerve palsy,* ***†*** *Fisher's exact test;* ***‡*** *Cochran-Armitage trend test. ¶ The Spearman's rank correlation coefficient between symptoms period and recovery ONP period (n=7) was 0.764 (p =0.046).*

CONCLUSION

Among the factors that influence ONP recovery, early decompression of the posterior communicating aneurysm yielded satisfactory recovery. The severity of the ONP may also play an important role, but if posterior communicating aneurysm is treated early, ONP can be reversible. In our patients, the first component of oculomotor function to recover was the parasympathetic fibers.

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