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Clinical commentary

# Changing paradigm in the management of elderly patients with intracranial aneurysms: An institutional review

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ABSTRACT

Optimal treatment of intracranial aneurysms (IAs) in elderly patients has not yet been well established. We have investigated the clinical and radiological outcomes and predictors of unfavorable outcome of IAs in elderly patients. Radiological and clinical data of 85 elderly patients from 2010 through 2015 were retrospectively reviewed. Significant differences between the groups were determined by a chi-square test. Regression analysis was performed to identify the predictors of unfavorable outcome. Among the 85 patients with IAs, the number of patients with >7 mm size aneurysm ($p = 0.01$), diabetes mellitus (DM) ($p = 0.02$), smoking (0.009) and Hunt and Hess grade 4–5 ($p = 0.003$) was significantly higher in the ruptured group compared to the unruptured group. Similarly, the number of patients who underwent clipping was higher in the ruptured aneurysm group ($p = 0.01$). The overall clinical outcome was comparatively better in the unruptured group ($p = 0.03$); however, microsurgical clipping of aneurysms provides a significantly higher rate of complete aneurysmal occlusion ($p = 0.008$). Overall, there was no significant difference in outcome in respect to treatment approach. In regression analysis, hypertension (HTN), obstructive sleep apnea (OSA), prior stroke, ruptured aneurysms and partial occlusion of aneurysms were identified as predictors of unfavorable outcome of IAs. Intracranial aneurysms in elderly patients reveals that endovascular treatment provides better clinical outcome; however, microsurgical clipping yields higher complete occlusion. Retreatment of residual aneurysms was comparatively more in the coiling group. Practice pattern has shifted from clipping to coiling for aneurysms in posterior circulation but not for aneurysms in anterior circulation.



## 1. Introduction

The number of elderly population is increasing globally due to medical advances [1]. In the USA, the elderly population has increased from 12 million in 1950 to 42 million in 2014, and it is expected to continue growing at a more rapid rate [2]. As this population expands, the number of patients with intracranial aneurysms (IAs) will increase in this particular population [1–3]. In addition, the development of less invasive and higher quality diagnostic tools including computerized tomographic angiography (CTA) and magnetic resonance angiography (MRA), has made diagnosing IAs easier [1]. However, coexisting comorbidities in elderly people sometime make it difficult to decide a suitable treatment procedure for them [1]. There is currently no general consensus on the optimum treatment for elderly people with IAs, and it is imperative to develop specific strategies of treatment for this particular population [3]. Recently, advances in less invasive techniques such as an endovascular procedure have challenged traditional microsurgical clipping of aneurysms [3–5]. Changes in practice type was also observed with shifting of microsurgical clipping to coiling for IAs in posterior circulation [6]. In this study, we have retrospectively reviewed our recent experience in treating elderly patients with IAs who underwent either endovascular treatment or microsurgical clipping.

## 2. Method and materials

This study was performed after approval of our institutional review board and in compliance with Health Insurance Portability and Accountability Act (HIPAA) regulations. Clinical and radiological data and outcomes of patients with IAs who underwent either

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coiling or microsurgical clipping between January 2010 and December 2015 were collected by review of their medical records and relevant imaging.

## 3. Approach to treating elderly patients with aneurysms

At our center, we prefer to perform endovascular coiling for elderly patients with IAs, especially those with comorbidities. The reason for choosing coiling for them are their comparatively shorter life expectancy and lesser procedure-related morbidity and mortality. We use the same technical concept for patients of any age to secure complete embolization. However, those are having less comorbidities, with indication for clipping, allow us to do microsurgical clipping.

## 4. Endovascular procedure

Embolization was performed soon after admission in the patients with unruptured aneurysms. In patients with ruptured aneurysms, endovascular treatment was done within three days after subarachnoid hemorrhage (SAH). A femoral approach was used in all patients with IAs. A 6F guiding catheter (Cordis Neurovascular, Miami Lakes, Fla) was used. A Tracker Excel-14 microcatheter and a Transend EX or platinum 14-guidewire (Boston Scientific) were used for selective catheterization of the aneurysm. Axium Detachable Coil (Covidien EV3, Plymouth, MN 55441, USA) was used for selective for aneurysmal embolization. Neuroform EZ stent (Boston/Stryker, Billerica, MA 01821) was used in those who were treated with a stent. We used MYNXGRIP vascular closing device (Dublin, OH 43017) for the balloon-remodeling technique. Angio-Seal Evolution, ST JUDE MEDICAL (St. Paul, MN55117-9983 USA) was used for closing and hemostasis at the femoral puncture site.

**Table 1**
Patients' demographics.

| Variables | Value |
|---|---|
| Total patients | 85 |
| Age | |
| Median | 70 |
| Range | 65–84 |
| Gender | |
| Male | 22 (26%) |
| Female | 63 (74%) |
| Ethnicity | |
| Caucasians | 61 (72%) |
| African Americans | 24 (28%) |
| Number of aneurysms | |
| Single | 65 (76.5%) |
| Multiple | 20 (23.5%) |
| Ruptured | 27 (32%) |
| Size | |
| Aneurysm | 8.4 ± 3.70 |
| Neck | 3.8 ± 1.8 |
| Hunt and Hess scale | |
| Unruptured | 58 (68%) |
| Ruptured | 27 (32%) |
| Grade I | 4 (15%) |
| Grade II | 4 (15%) |
| Grade III | 11 (41%) |
| Grade IV | 5 (18%) |
| Grade V | 3 (11%) |
| Comorbidities | |
| BMI >30 | 28 (33%) |
| Hyperlipidemia | 21 (25%) |
| HTN | 71 (83.5%) |
| DM | 19 (22.4%) |
| CHD | 16 (19%) |
| Prior Stroke | 26 (31%) |
| Smoking | 39 (46%) |
| Depression | 15 (18%) |
| OSA | 12 (14%) |

## 5. Microsurgical clipping

The aneurysms in anterior circulation were mostly approached by standard pterional craniotomy with or without orbitozygomatic osteotomy [7]. All basilar artery aneurysms were clipped by pterional approach. In some cases, skull base modification technique such as orbitozygomatic osteotomy and or drilling of posterior clinoid was performed [7,8]. Proximal posterior inferior cerebellar artery and vertebrobasilar junction aneurysms were clipped by far lateral approach [9]. The extent of aneurysmal occlusion was observed directly just after treatment. Within three days after the coiling procedure, all patients underwent magnetic resonance (MR) imaging including diffusion-weighted imaging (DWI). Then after 6 months of follow-up, vessel status was observed with digital subtraction angiography (DSA) by a neuroradiologist experienced in aneurysm therapy.

## 6. Diagnosis of OSA

OSA was screened by using STOPBANG questionnaire and confirmed by polysomnography.

### 6.1. Hunt and Hess scale

In the present study, we have graded the patients' pre-operative clinical symptoms using the Hunt and Hess scale (H and H 0 = unruptured aneurysms, H and H 1 = asymptomatic or slight headache and neck stiffness, H and H 2 = moderate to severe headache and neck stiffness, H and H 3 = drowsy and minimal neurological deficits, H and H 4 = stuporous and moderate to severe hemiparesis, H and H 5 = coma).

**Table 2**
Locations of aneurysms.

| Variables | Value |
|---|---|
| Location | |
| Anterior Circulation | 72 (84.6%) |
| ICA | 2 (2.4) |
| ACA | 4 (4.7%) |
| Acom | 18 (21.2%) |
| PCom | 13 (15.2%) |
| MCA | 13 (15.2%) |
| Opthalmic | 11 (12.9%) |
| Paraclinoidal | 4 (4.7%) |
| Superior hypophyseal | 1 (1.2%) |
| Anterior choroidal | 2 (2.4%) |
| Pericallosal | 1 (1.2%) |
| Cavernous | 3 (3.5%) |
| Posterior circulation | 13 (15.4%) |
| Basilar | 4 (4.7%) |
| Basilar tip | 6 (7.1%) |
| VA | 1 (1.2%) |
| PICA | 2 (2.4%) |
| Clinical feature | |
| Headache | 62 (73%) |
| Dizziness | 7 (8.2%) |
| Visual impairment | 4 (4.7%) |
| Altered mental status | 3 (3.5%) |
| Aphasia | 1 (1.2%) |
| LOC | 2 (2.4%) |
| Hemiparesis | 4 (4.7%) |
| CN III palsy | 3 (3.5%) |
| Ataxia | 2 (2.4%) |
| Treatment status | |
| Coiling | 49 (57.6%) |
| Clipping | 27 (31.8%) |
| Observation | 9 (10.6%) |
| Adjuvant with coiling | |
| Stent assisted | 24 (28.2%) |
| Balloon assisted | 5 (5.9%) |
| Thrombolysis | 3 (3.5%) |