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Anesthesia Risks: Craniotomy versus Interventional Procedures

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Risks

Craniotomy vs Endovascular

- Risks associated with diagnosis
- ... type of treatment
- ... type of anesthetic



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Risks: Diagnosis

Vascular

- **Cerebral aneurysm**
- **Arteriovenous or cavernous malformation**



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Risks: Diagnosis

Rupture or bleed !



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Treatment

Craniotomy

Endovascular

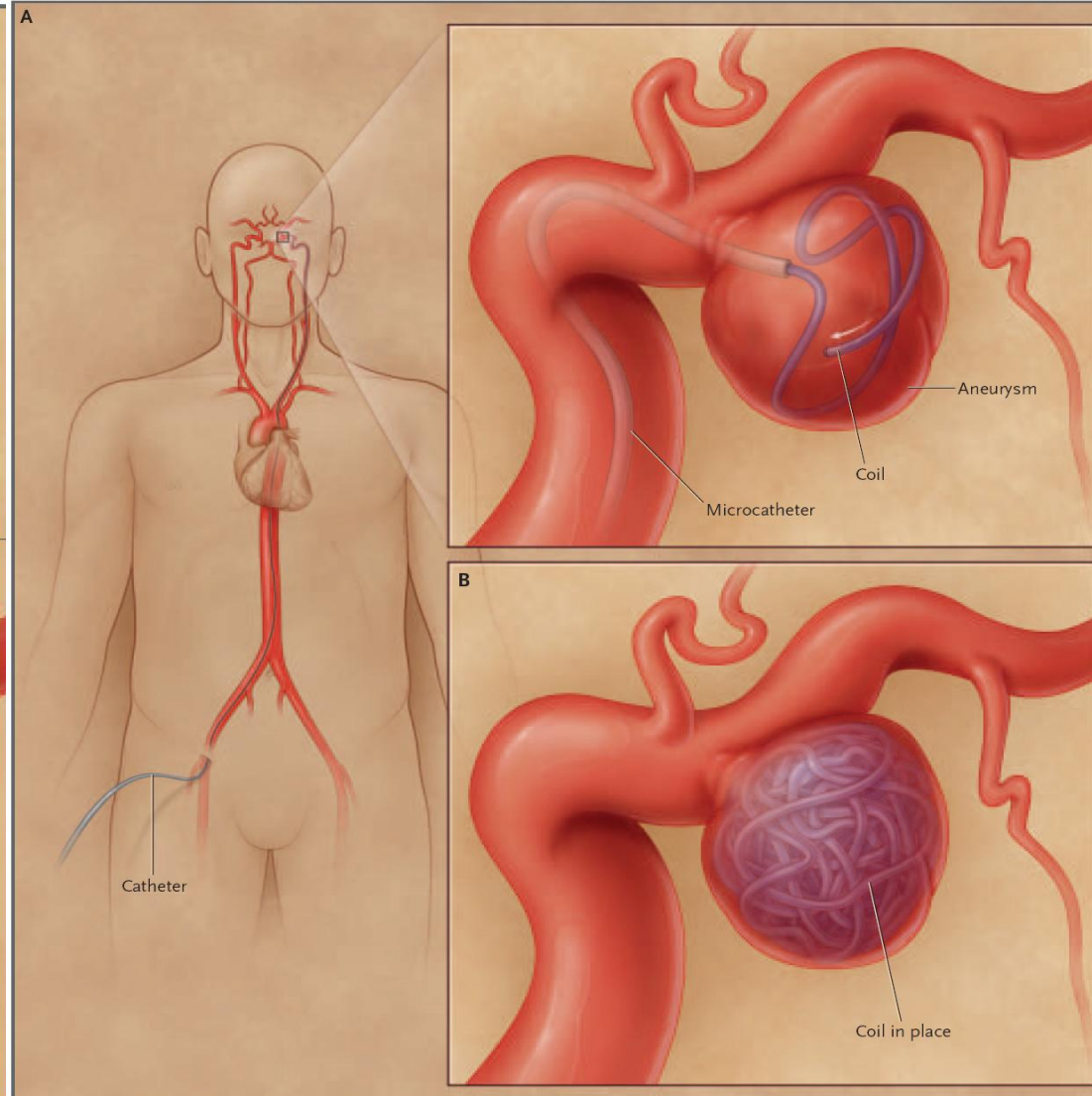
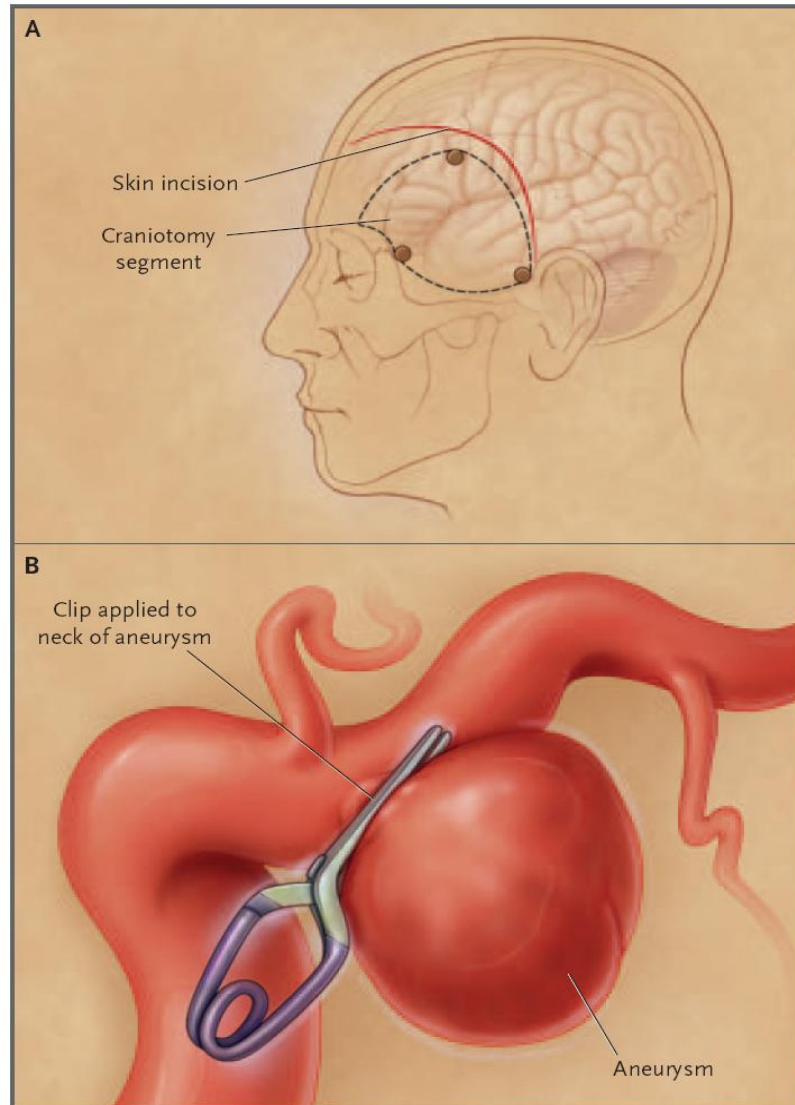


Figure 2. Microsurgical Clipping of an Aneurysm of the Posterior Communicating Artery.

Figure 3. Endovascular Occlusion of an Aneurysm of the Posterior Communicating Artery with Guglielmi Detachable Coils.
Brisman et al., NEJM 355: 928-39, 2006

Risks: Treatment

Craniotomy

- Rupture (aneurysm, AVM)
- Retraction

Endovascular

- Problem with wire
- Embolism (coil)
- Rupture (aneurysm, AVM)



Craniotomy: Rupture

- 1269 Pts
- 113 Intra-operative Ruptures
- 7.9%/surgery
- IOR rate greatest for:
 - PICA (15.6%)
 - ACOM (9.3%)
 - PCOM (9.1%)
 - Ruptured>Unruptured (10.7% vs 1.2%)
 - ↓w temp occlusion (3.1% vs 8.6%)

Craniotomy: Rupture

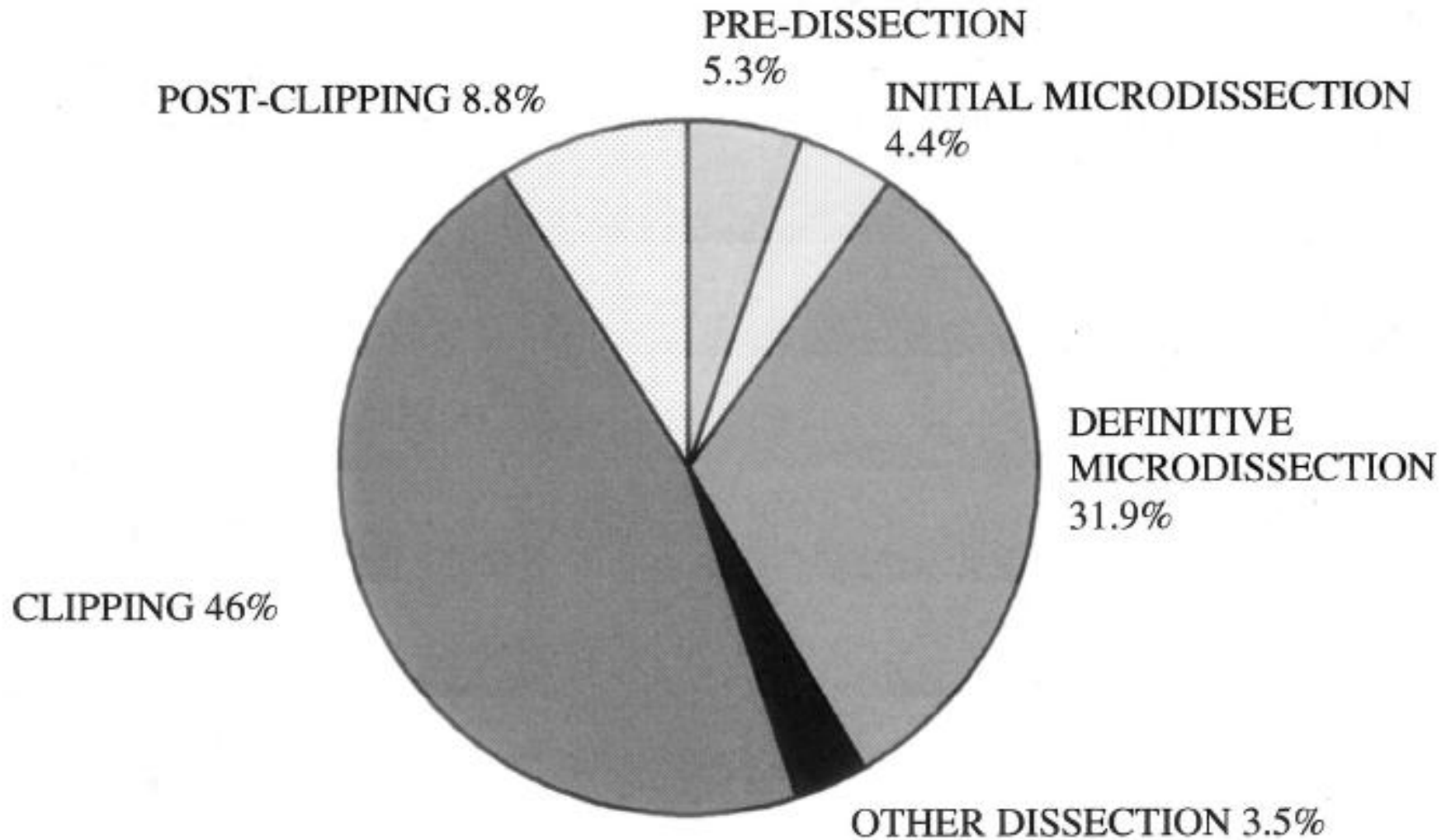


FIGURE 1. Pie chart showing the percentage of IORs occurring at specific times during surgery.

Endovascular: Rupture

**Rupture during catheter
advancement into aneurysm
or coil placement (1.4%-2.7%,
assoc mortality 30-40%)**

Incidence: Rupture

Depends on experience



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Types of Anesthetics

–General

**–Monitored anesthesia
care (MAC)**



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Risks: Anesthetic

Craniotomy

1) General Anesthesia (GA)

2) MAC

Endovascular

1) GA

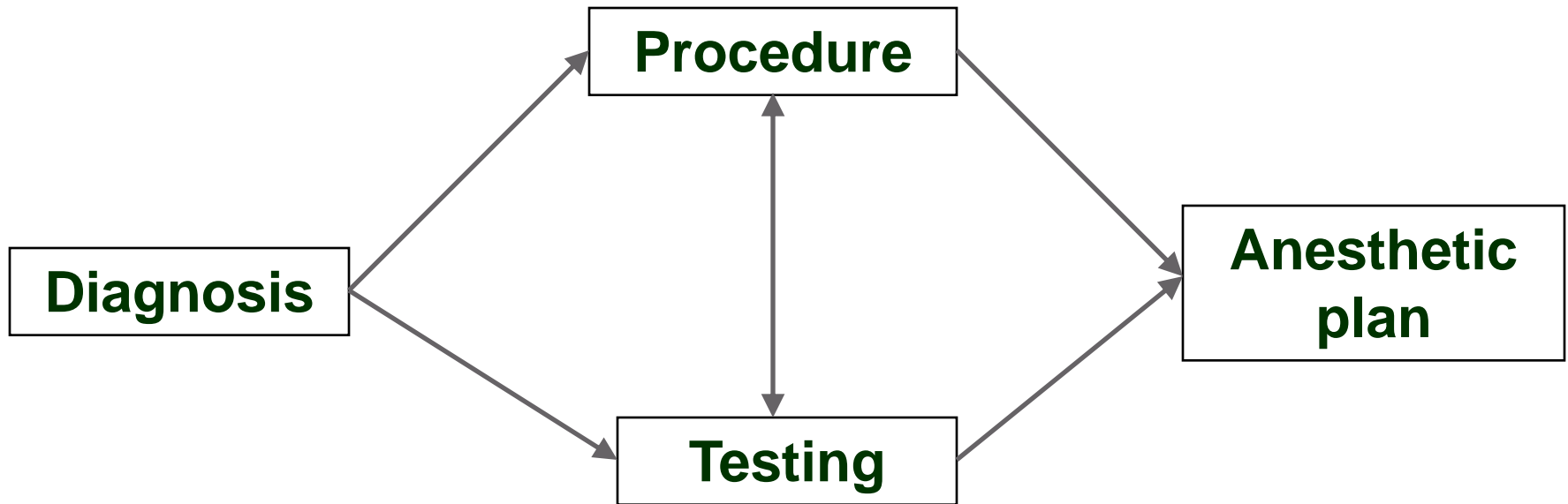
2) MAC



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How do we decide on an anesthetic plan?



Cerebral aneurysm, GA

AVM, GA or MAC



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General Anesthesia

- Impair consciousness**
- Analgesia**
- Amnesia**
- Muscle relaxation**
- Blunt autonomic responses**



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General Anesthesia

Advantages

- **Airway control**
- **Perform electrophysiologic testing comfortably**
- **Control hemodynamics**
- **Eliminate movement**
- **Better control if intra-operative rupture**

Disadvantages

- **Unable to perform cognitive testing**



Craniotomy

- **Increased ICP**
 - 1) **Diuresis**
 - a) **Mannitol**
 - b) **Furosemide**
 - 2) **Steroids**
 - a) **Glucose control**
- **Brain relaxation**
 - 1) **Diuresis**
 - 2) **Steroids**
 - 3) **TIVA**
- **Control of blood pressure**
 - 1) **Inhalational agents**
 - 2) **Intravenous**
- **Cerebral protection**
 - 1) **Cooling**
 - 2) **Barbiturates**
- **Hemorrhage**
 - 1) **Surgical control**

Craniotomy: Problems

- Pain from bone**
- Pain from scalp**
- May have N/V from medications**
- GA or MAC**



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Monitored Anesthesia Care

Advantages: Big MAC vs Small MAC

- **“GA” without ETT**
- **Perform cognitive testing**

Disadvantages:

- **Less control if aneurysm ruptures**
- **Less control of airway**
- **May move**



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Problems from Treatment: Endovascular

- **Vascular occlusion (cerebral infarction)**
 - 1) Thromboembolism
 - 2) Balloon or coil misplacement
 - 3) Catheters
 - 4) Vasospasm
- **Hemorrhage**
 - 1) Aneurysm rupture
 - 2) Perforation of normal vessel
 - a) By catheter
 - b) Guidewire
 - c) Coil
 - d) Injection of contrast
- **Inc in arterial BP and dec in HR suggestive of inc ICP due to extravasation of contrast**

Endovascular

- No pain from bone**
- No pain from scalp**
- May have N/V from medications**
- GA or MAC**



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Testing

- **Cognitive (need patient cooperative and awake)**
- **Evoked potential (BAER, SSEP, MEP)**
- **Electroencephalography**



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Real Question

Is GA for craniotomy different than GA for endovascular treatment of aneurysm, AVM, etc.?



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Real Question

- **No studies**
- **But, in International subarachnoid aneurysm trial (ISAT Study)**

2143 pts randomized: crani vs coiling

No comment on anesthesia, but

GA probably in both

Treatment was determining factor, not anesthesia



Conclusion

- Risks associated with treatment of vascular lesions are based on diagnosis, treatment and anesthetic technique
- All of the treatments can be performed with either a general or MAC anesthetic. There are advantages and disadvantages to each.

