Section: Neurosurgery

Original Research Article

# SIGNIFICANCE OF INTRAOPERATIVE INDOCYANINE GREEN VIDEO ANGIOGRAPHY IN INTRACRANIAL ANEURYSMAL CLIPPING

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## Abstract

**Background:** The introduction of indocyanine green (ICG) video angiography (VA) has impacted significantly the practice of operative microscopic assisted neurosurgery over the many years. Several clinical studies have studied about the use of ICGVA during aneurysm surgery. We describe our institutional experience with the use of ICGVA and its significance during aneurysmal clipping. **Materials and Methods:** From December 2022 to July 2023, we performed both ICGVA in 16 aneurysm surgeries. For visualization, the Leica operating microscope with integrated near-infrared ICG angiography (IR800) was used. ICG is intravenously injected and visualized within the exposed vessels when patent. Intraoperative ICG-VA was performed in all patients without complications. All the patient were evaluated with pre clipping and post clipping angiographic images for the patency of parent, branching, perforating vessels and remnant part of aneurysm after clipping. **Result:** Diagnostic images of preoperative CT cerebral angiography using 4D reconstruction, intraoperative use of ICGVA images and videos before and after aneurysm clipping and postoperative routine CT Brain were obtained on all 16 patients. ICGVA resulted in clip removal and repositioning in three cases when poor distal flow was encountered and the addition of extra clips in one case to avoid residual aneurysmal filling. All our sixteen patients were improved post operatively and discharged and all patients are in regular follow up till date. **Conclusion:** In our experience, ICGVA carries the significant advantages of rapid information and patency of parent, branching, perforating vessels and remnant part of aneurysm after clipping.

## INTRODUCTION

Indocyanine green (ICG) video angiography (VA) in intracranial aneurysmal clipping. During 2022-2023 we have used ICG VA in sixteen intracranial aneurysmal surgeries. This Provides a direct observation of blood flow in parent, branching, and perforating vessels.

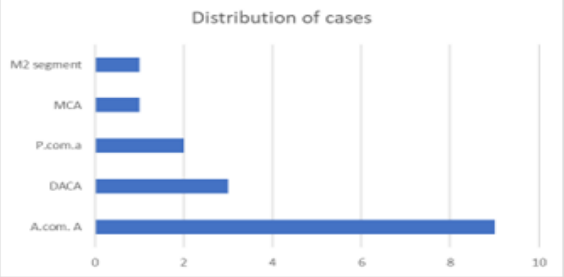
## MATERIALS AND METHODS

AUROGREEN comes in powdered form. It should be diluted with the given 5ml saline. It should be stirred up well before injecting. And there is a filter while injecting it. This ICG binds tightly to plasma proteins and becomes confined to the vascular system soon after the injection. The half-life of ICG is 150 to 180 seconds. It is excreted by the liver. [1-5]

**Side Effect:** Anaphylactic shock, hypotension, tachycardia, dyspnoea and urticaria. The risk of severe side-effects rises in patients with chronic kidney impairment. [6-10]

Study Design: In our study we have included 7 female patients and 9 male patients. All the patients were around 50yrs of age.

**Distribution of our Cases**




**Graph 1: Distribution of Cases.**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**Inclusion Criteria**

- Normal LFT
- Hunt-Hess Scale grade I, II, III.

**Exclusion Criteria**

- Ischemic heart disease.
- Allergic reaction due to Iodine.
- Elevated RFT.
- Complex aneurysm.
- GCS below 8 on admission.

**Clinical Picture**

Accelerated hypertension at the time of presentation in fourteen patients, and two patients presented with third cranial nerve palsy alone. Headache was the predominant symptoms in all of our patients. Subarachnoid haemorrhage was found in routine CT brain in all patients except in two who were having third nerve palsy. Two patients were also having hemiparesis at the time of presentation.

## DISCUSSION

ICG-VA, a bolus of 25 mg of ICG dye (aurogreen) was injected via a peripheral vein after test dose. For visualization, the Leica operating microscope with integrated near-infrared ICG angiography (IR800) was used. [2,11-15] ICG is intravenously injected and visualized within the exposed vessels when patent. Intraoperative ICG-VA was performed in all patients without complications. ICGVA resulted in clip removal and repositioning in three cases when poor distal flow was encountered and the addition of extra clips in one case to avoid residual aneurysmal filling. All the patient were evaluated with pre clipping and post clipping angiographic images for the patency of parent, branching, perforating vessels and remnant part of aneurysm after clipping.[12,15,16]

**Advantages**

1. Avoidance incomplete aneurysm occlusion.
2. Short performance time (3–5 minutes).
3. Low costs compared with DSA.
4. Very low complication rate.
5. Repetitive assessments during 1 surgery possible.
6. Clip replacement with in ischemic threshold time possible.
7. Short interruption of surgical action.
8. Perforator patency inspection reliable.
9. Surgical manipulation during ICG-VA possible.

**Disadvantages**

1. Not reliable in complex aneurysm anatomy.
2. Only dissected vessels are assessable.
3. No 360° view.
4. Plaques & blood obscure the assessment.
5. Incorrect during evaluation of intravascular low-flow sectors.
6. False-negative assessment possible.
7. No 3D reconstruction available.

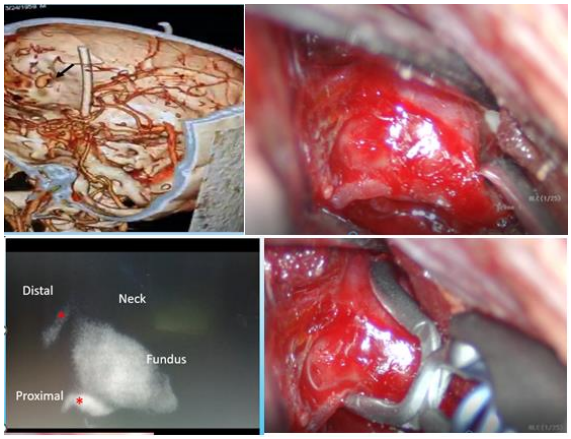


**Figure 1: DACA aneurysm A2-A3 junction facing inferiorly, A Showing DACA aneurysm, black arrow, B Intraoperative microscopic image of aneurysm, C under ICG VA parts of aneurysm visualized before clipping, D Neck of the aneurysm being clipped.**

## CONCLUSION

ICG-VA is helpful intraoperative tool for patency of parent, branching, perforating vessels and remnant part of aneurysm after clipping. [12,15]

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