

# Minimally Invasive Endoscopic Transorbital Approach for the Development of a Selective Focal Cerebral

## Ischemia Porcine Model: An Alternative Technique

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### Introduction

There is increasing interest in the development of non-rodent ischemic stroke models for the purposes of translational research. Primate models are ideal, but are prohibitively expensive for use in large studies. Porcine models, having cerebral structure that closely mimics that of humans, have been successfully used. Unfortunately, their cerebrovascular anatomy precludes the use of endovascular methods for inducing ischemic stroke.

The most common method for the creation of a focal infarct in the porcine model has been a fronto-temporal craniectomy with sacrifice of the MCA artery. This procedure, while effective, is time consuming (~4hrs), requires the use of an operating microscope, and potentially introduces non-stroke related brain injury. We report a minimally invasive transorbital endoscopic approach for the development of a focal cerebral ischemic stroke in pigs.

### Methods

A left transpalpebral eye exenteration was performed in 2 pigs under general anesthesia. Using an endoscope for viewing, access to the internal carotid artery bifurcation was gained by creating a 1x1 cm craniectomy just superior to optic foramen in posterior wall of the orbit. The dura was opened and clip ligation of the MCA was performed. After 2 hours of vessel occlusion, the pigs were sacrificed and the brains harvested. The fresh brain specimens were sliced in the coronal plane and stained with tetrazolium chloride. Slices were viewed macroscopically to verify the presence of focal ischemia within the MCA distribution.

### Results

Of the 2 pigs, both tolerated the procedure well. There were no intra-operative complications. The average procedure time was 1.25 hours from induction of anesthesia to completion. In both animals a focal left MCA ischemic infarct was verified.

### Conclusions

The transorbital endoscopic approach is an effective, reliable, minimally invasive technique for the development of an experimental porcine ischemic stroke model. It is significantly faster than the standard craniectomy approach, obviates the need for operative microscopy, and reduces the risk of non-ischemic brain injury.

### Learning Objectives

The minimally invasive endoscopic transorbital approach could offer an efficient technique for the development of an ischemic stroke swine model. Swine stroke models, as well reported in the literature, can serve an important function in translational pre-clinical ischemic stroke research.

### References

1. Simon Platt et al. Development and characterization of a Yucatan miniature biomedical pig permanent middle cerebral artery occlusion stroke model. *Experimental & Translational Stroke Medicine* 2014, 6:5
2. Marc Fisher et al. Update of the Stroke Therapy Academic Industry Roundtable Preclinical Recommendations. *Stroke*. 2009;40:2244-2250

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