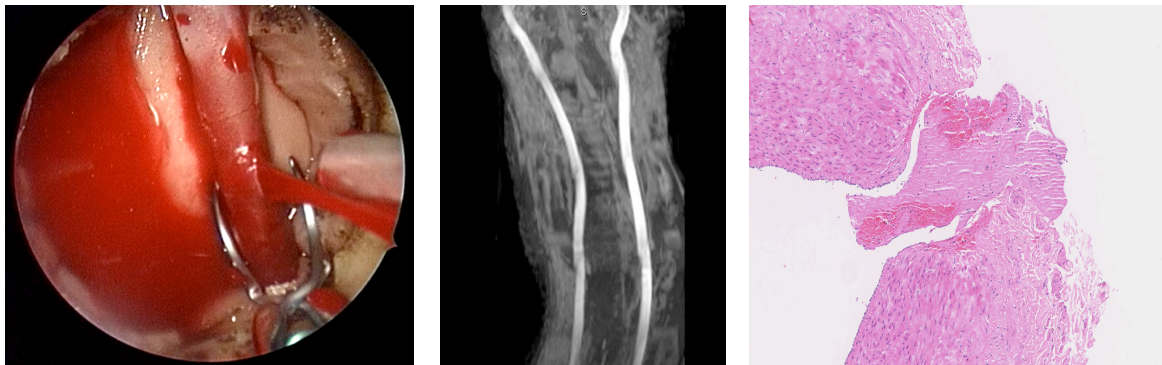


Management of Major Vessel Haemorrhage In Endonasal Surgery



By

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Discipline of Surgery
Otolaryngology, Head and Neck Surgery
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Abstract

Introduction

Endoscopic endonasal surgery (EES) is fast becoming the method of choice to address pathology of the paranasal sinuses and skull base. It carries with it advantages in regards to visualization, magnification, avoidance of scars, reduced length of stay and patient morbidity. With its greater utilization there needs to be an appreciation of its potential limitations as well. The most feared and potentially catastrophic complication for the endoscopic surgeon is that of inadvertent carotid artery injury (CAI). This represents a challenging surgical environment, a high pressure / high flow haemorrhagic scenario which can result in exsanguination of the patient. Current treatment recommendations, such as nasal packing, can result in increased patient morbidity. Despite acute management, patients may still be at risk in the long term due to the potential of vessel spasm, thrombosis, cerebral insult secondary to embolism, pseudoaneurysm or even carotico-cavernous fistula formation. The aims of the studies presented in this thesis are to develop and evaluate safe endoscopic haemostatic techniques on different injury types, explore their mechanisms of action, report on the value of training surgeons in these techniques, while assessing the success of their use in the clinical setting.

Methods

A sheep model of carotid artery injury was employed to simulate the high pressure / high flow arterial bleeding environment. This allowed for different endoscopic haemostats such as a crushed muscle patch, aneurysm clip and bipolar cautery, to be randomised and evaluated on different injury types. The muscle patch was

assessed further on a series of large animal carotid lacerations, which were harvested at different time points and histologically analysed. The direct vessel closure technique in the form the AnastoClip (LeMaitre, Burlington, MA) was evaluated in a separate prospective large animal study. A retrospective review of surgeons who had undergone vascular injury training in our workshops who subsequently managed a CAI was conducted to evaluate the outcomes after vascular injury training.

Results

A crushed muscle patch and aneurysm clip proved to be effective in gaining haemostasis in the endoscopic carotid haemorrhage setting as well as maintaining normal carotid characteristics in the long-term. The success of the crushed muscle patch appears to be due to its ability to provide a seal of the vessel injury site and promote platelet aggregation, which is compounded by an acute and chronic tissue healing response. The AnastoClip was successful in gaining control of high pressure / high flow bleeding and maintains carotid patency in the long-term with minimal endoluminal penetration. Vascular injury trained surgeons are able to appropriately manage this catastrophic situation, a review of their CAI cases revealed a mortality rate of 0% with no permanent morbidity for their patients.

Conclusions

Studies presented in this thesis present evidence for new endoscopic haemostatic techniques. These have proved to be effective in the immediate setting as well as safe in the long-term, reducing the probability of pseudoaneurysm formation and maintaining normal carotid patency and flow. The training of surgeons in these

techniques has shown a direct benefit for patients, reducing the mortality and morbidity rate in the setting of CAI.

Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution to Vikram Padhye and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Presentations and Awards

Presentations

Australian Society of Otolaryngology Head & Neck Surgery Scientific Meeting
Perth, Australia 2013

Use of a muscle patch in carotid artery injury

American Academy of Rhinology Annual Scientific Meeting
Vancouver, Canada 2013

Early and late complications of endoscopic haemostatic techniques

TQEH Research Foundation / Basil Hetzel Institute Research Day
Adelaide, Australia 2013

Early and late complications of endoscopic haemostatic techniques

North American Masterclass in Endoscopic Sinus Surgery
Montreal, Canada 2013

Early and late complications of endoscopic haemostatic techniques

Merits of Vascular Injury Training

American Academy of Rhinology Annual Scientific Meeting
Orlando, USA 2014

Coping with Catastrophe: Value of vascular training

Endoscopic Direct Vessel Closure in Carotid Artery Injury

Australian Society of Otolaryngology Head & Neck Surgery State Meeting
Adelaide, Australia 2014

Early and late complications of endoscopic haemostatic techniques

Awards

Ron Gristwood Medal for Excellence in ENT Research

Australian Society of Otolaryngology Head & Neck Surgery State Award 2014

Best Junior PhD: Scientific Category

TQEH Research Foundation / Basil Hetzel Institute Research Day 2013