An Enhanced Recovery Protocol for Endoscopic Endonasal Pituitary Surgery

Shannon Hart, MD[1]; Jessy Moore, MSc[1]; Ezequiel Yasuda, MD[2]; Almunder Algird, MD FRCSC[1]; Doron Sommer MD FRCSC[1]; Ryan Smith MD FRCPC[1]; Justin Khetani MD FRCSC[1]; William Harper MD FRCPC[1]; Kesava Reddy MD FRCSC[1]
[1]McMaster University, Canada [2]University of Buenos Aires, Argentina

Introduction

The endoscopic transsphenoidal approach to surgical resection of pituitary adenomas is a widely accepted and preferred method of resecting most pituitary adenomas. This approach is minimally invasive and is associated with shorter operative time, shorter length of hospital stay, less post-operative complications, and improved pain control[3]. That said, reports suggest that average hospital stay is still 3-5 days post-operatively in routine cases[4,5], to account for neurologic and endocrinologic monitoring, progressive mobilization, pain control, and surveillance for complications such as cerebrospinal fluid (CSF) leak. It is unclear whether this period of monitoring is required or even beneficial to reduce surgical complications and improve outcomes.

Enhanced Recovery After Surgery (ERAS) protocols have been progressively introduced to peri-operative care for decades. ERAS is an evidence-based approach to surgical care which employs multimodal strategies that include pre-operative counselling, standardized analgesia and anesthetic regimens, optimization of nutrition, early mobilization and use of minimally invasive techniques[6–9]. The main goal of ERAS is to shorten hospital length of stay (LOS), reduce complications, and improve patient satisfaction and outcomes. That said, there are currently no consensus guidelines regarding ERAS after neurosurgery. Several recent articles have adopted the use of ERAS strategies from other surgical specialities for use in neurosurgery[10]. Specifically regarding endonasal approaches to pituitary tumours, trials of shortened hospital stays or even ambulatory surgery have been reported with low complication rates[11,12], though these involve small sample sizes and do not involve comprehensive ERAS protocols . The aim of the current study was to develop a comprehensive, multidisciplinary ERAS protocol tailored to pituitary surgery.

Objectives

Primary objective:
Create a perioperative care protocol for patients undergoing routine pituitary surgery that optimizes intravascular fluid management and pain control; prevents post-op nausea and vomiting (PONV), catheter associated urinary tract infections (CAUTI), and surgical site infections; and reduces length of stay (LOS) and cost – leading to overall improved patient outcomes and satisfaction.

ERAS Development Process

Assembly of Multidisciplinary ERAS Team
McMaster Minimally Invasive Neurosurgery (MacMINS) is a multidisciplinary skull base group at McMaster University in Canada, designated as a NASBS multidisciplinary team of distinction. The aim of this group is the advancement of minimally invasive and skull base neurosurgery in Southwestern Ontario. The group is comprised of specialists within neurosurgery, otolaryngology, anesthesia, endocrinology, ophthalmology, and clinical research.

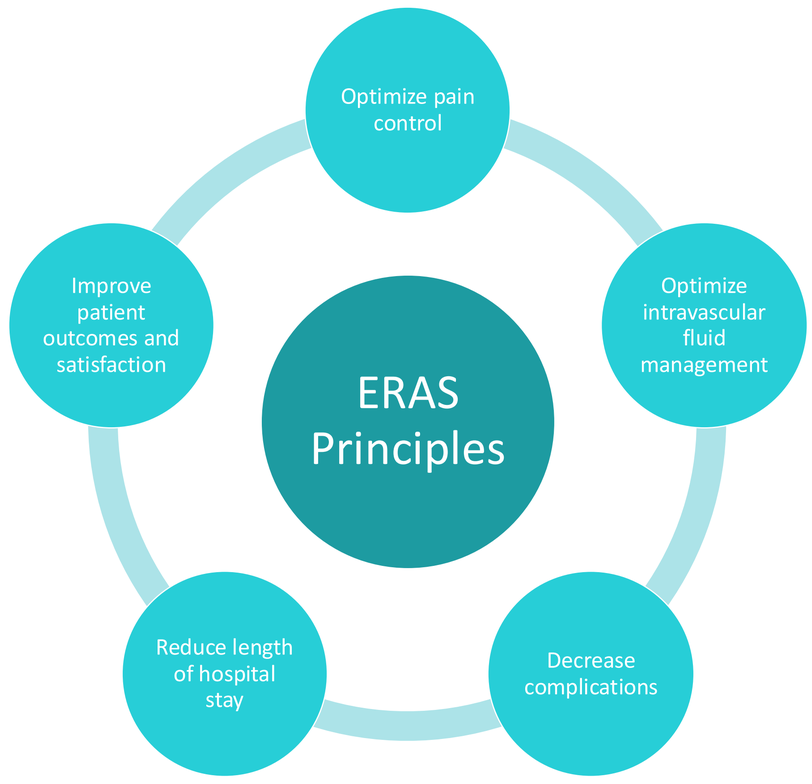
Literature Review and Establishment of Best Practice Guidelines
A scoping literature review was performed to assess current evidence and best practices regarding peri-operative care of pituitary surgery patients. A summary of this data was presented to the multi-disciplinary team. Where applicable, clinical experience and preferences of the team members was taken into consideration, and consensus was achieved through discussion. Several generic management principles were adopted from existing evidence-based ERAS programs at Hamilton Health Sciences as well as within the literature, such as early removal of indwelling urinary catheter and preferential use of non-opioid analgesia.

Development of Order Sets & Patient Education Materials
Our team developed practical items for systematic delivery to guide perioperative nursing care, medications, investigations, consultations, and other interventions. An existing patient education pamphlet was edited and optimized.

Education of Clinical Providers and Frontline Staff
Frontline staff members were educated regarding the rationale and specifics of ERAS prior to implementation and given opportunities to provide feedback and ask questions.

ERAS Protocol

Pre-Op	Work-Up	Labs, visual field analysis, anesthetist evaluation
	Patient Education	Expectations, LOS, nasal irrigation demonstration
	Orders	SCDs, Head CT (navigation), pre-op antibiotics, TXA, catheter placement, analgesia, PONV prophylaxis
	Nutrition	NPO midnight prior to surgery EXCEPT clear fluid up to 2 hours before OR 4 hours if DM/gastroparesis
Intra-Op	General	TIVA, neuromuscular blockade, reduce opioid use, lidocaine infusion
	Lines	2 large bore IVs, arterial line PRN
	Positioning	Supine, head and neck midline, use of navigation system
	Procedures	Facial blocks, Sphenopalatine ganglion block, use of nasoseptal flap, fat, +/- fascia lata for reconstruction, insert Doyle splints with polysporin
	Hemodynamics	Targets: SBP <160, CPP<60, HR 60-80
	Fluid management	Goal of euvolemia
	PONV prophylaxis	OG tube, ondansetron, avoid dexamethasone
	Urinary catheter	Inserted after induction
Post-Op	General	HOB 30deg, vitals, neurological assessments, pain scores, accurate intake/output, dysphagia screen
	Disposition	Post-Anesthesia Care Unit followed by neurosurgical step-down unit or ICU
	Urinary catheter	Remove POD1
	Labs	Immediate PACU: LBC, glucose, urine osmolality POD1: 0800h cortisol, CBC, LBC, glucose, urine osmolality, INR/PTT
	Medications	Pain regimen, PONV, bowel protocol, acid suppression, antibiotics
	Consultations	ENT, Endocrinology, PT/OT
	Other	VTE prophylaxis, nasal irrigation TID, CT head wo contrast
Discharge Criteria	1. Stable and normal vital signs 2. Intact and/or stable neurological exam results 3. Post-operative pain well-controlled with oral medication 4. Normal eating and independent ambulation 5. No evidence of CSF leak 6. Presence of responsible adult at home 7. Normal or unconcerning CT	
Follow Up	• Endocrinologist – daily phone call through POD4, labs 1 week post discharge, follow up appointment 6 weeks post-op • ENT – 2-3 weeks post-op • Neurosurgery – 6 weeks post-op with MRI Pituitary Gad+ • Neuro-Ophthalmology – Visual field assessment 6 weeks post-op	



Conclusions & Future Directions

- ERAS protocols are evidence-based approaches to surgical care employing multimodal strategies to recovery, though their use in pituitary surgery has not been widely adopted
- ERAS protocols for pituitary surgery may be an effective way to improve outcomes in this population
- Future directions will include a comparative analysis between centers that adopt this protocol and those who do not have an established ERAS protocol

Contact

Shannon Hart, MD
Division of Neurosurgery, McMaster University, Canada
shannon.hart@medportal.ca

MacMINS website: https://macmins.ca/

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