

# Enhanced Recovery After Surgery (ERAS) Protocol for Vestibular Schwannoma Patients: A Systematic Review

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## Background

- **Vestibular Schwannoma (VS)** has an incidence of about 1.1 per 100,000 individuals<sup>1,2</sup>
- Due to the **complex anatomy** involved in VS resection, postoperative complications such as facial nerve dysfunction, cerebrospinal fluid leaks, hearing loss, dizziness, and nausea/vomiting are not uncommon<sup>3,4,5,6</sup>
- **Enhanced Recovery After Surgery (ERAS)**, first introduced by Henrik Kehlet, is a **perioperative pathway** consisting of evidence-based interventions that promote accelerated recovery<sup>7</sup>
- There are currently **no formalized ERAS Society® recommendations** for patients undergoing VS resection<sup>8</sup>

## Objective

Investigate the efficacy of ERAS protocols and perioperative pathways on postoperative outcomes for patients undergoing VS resection

## Methods

We conducted a literature search for publications characterizing pathway-driven perioperative care outcomes in VS patients undergoing tumor resection, yielding only one study. We then expanded our search to include neurosurgical publications that included VS patients as a sub-population.

### Databases

- PubMed, Cochrane, Web of Science, Scopus, and Embase

### Inclusion Criteria

- Adult patients undergoing elective craniotomy for VS
- Use of a perioperative pathway employing at least one ERAS component based on Hagan et al.'s recommendations for craniotomy patients<sup>9</sup>

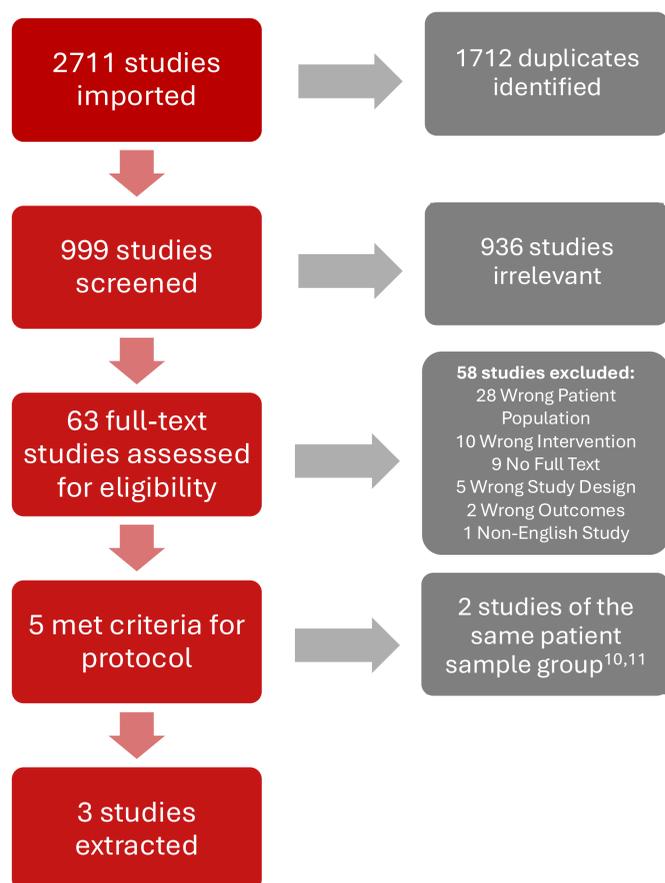
### Exclusion Criteria

- Studies without primary data, non-English studies, or studies with no full-text availability

### Outcomes

- Primary: postoperative length of stay (LOS)
- Secondary: postoperative pain scores, complications, mortality, hearing outcomes, balance outcomes

**Figure 1:** PRISMA flowchart of systematic search strategy



## Results

- **Three studies** met the inclusion criteria and underwent full data extraction
- All three studies included interventions targeting standardized patient education, shorter preoperative fasting windows, postoperative nausea and vomiting (PONV) prophylaxis, earlier postoperative mobilization, and opioid-sparing analgesia
- Patients enrolled in a perioperative pathway group experienced **reduced postoperative LOS** in 2/3 studies,<sup>12,13</sup> shorter ICU LOS<sup>14</sup>, and **reduced postoperative pain scores**<sup>12,13,14</sup>
- ERAS pathways were also associated with significantly **lower costs of hospitalization**, fewer days of postoperative pain, and shorter **time to first oral intake**<sup>12,13</sup>

**Table 1:** ERAS Pathway Elements

	ERAS Component	Wang 2018 <sup>12</sup>	Wang 2022 <sup>13</sup>	Yawn 2021 <sup>14</sup>
Preoperative Interventions	<b>Patient education</b>	Same as Control	Detailed education	Standardized in protocol
	<b>Smoking/alcohol abstinence</b>	Abstinence 2 weeks pre-op	Same as Control	n/a
	<b>Fasting and carbohydrate loading</b>	Fasting 6 hrs pre-op; oral carbohydrate loading	Fasting 6 hrs solids, clear fluids up to 2 hrs; oral carbohydrate loading	Clear fluids up to 2 hours pre-op
	<b>Anti-thrombotic prophylaxis</b>	Same as Control	Same as Control	Same as Control
	<b>Anti-microbial prophylaxis</b>	Chlorhexidine wash, cefazolin, minimal shaving; oral and nasal cavity prep	n/a	n/a
	<b>PONV prophylaxis</b>	Pre-op dexamethasone or 5HT receptor antagonist based on risk assessment	Pre-op dexamethasone or 5HT receptor antagonist based on risk assessment	Scopolamine patches; Standardized post-op pain and nausea orders with staff
Intraoperative Interventions	<b>Lung exercise</b>	Breathing exercises	Lung function exercise	n/a
	<b>Scalp blocks</b>	Scalp blocks (0.2% ropivacaine)	Scalp blocks (0.5% ropivacaine)	n/a
	<b>Avoiding hypothermia</b>	Heating pad and warmed fluids	Heating pad and warmed fluids	n/a
Postoperative Interventions	<b>Fluid balance</b>	Same as Control	Goal-directed	n/a
	<b>Urinary catheter use/removal</b>	Removal within 6 hrs post-op	Removal within 24 hrs post-op	n/a
	<b>Postoperative nutrition</b>	Earlier initiation of nutrient solution and normal diet	Oral liquids within 5 hrs	n/a
	<b>Early mobilization</b>	Bed exercises within 6 hrs of waking, ambulation within 24 hours post-op	Encouraged ambulation and in-bed mobilization	Earlier physical and occupational therapy evaluation
	<b>Opioid-sparing analgesia</b>	Minimization of perioperative opioids	Minimization of perioperative opioids	Pre-op gabapentin and acetaminophen to spare opioid use intra-op

**Table 1:** Common ERAS pathway elements and how they were implemented in each of the final studies. PONV, postoperative nausea and vomiting

**Table 2:** Postoperative LOS in ERAS vs Control Groups

	Study Design	Sample Size	VS Patients	Intervention	Control	Intervention Postoperative LOS (days)	Control Postoperative LOS (days)	p
Wang 2018 <sup>12</sup>	Randomized Controlled Trial	140	n = 16	Novel ERAS protocol	Conventional perioperative care	4 (1, 3, 6, 13) median (min, 1 <sup>st</sup> Q, 3 <sup>rd</sup> Q, max)	7 (3, 6, 11, 28) median (min, 1 <sup>st</sup> Q, 3 <sup>rd</sup> Q, max)	<0.0001
Wang 2022 <sup>13</sup>	Randomized Controlled Trial	151	n = 6	Novel ERAS protocol	Conventional perioperative care	Median = 3 (IQR 2,4)	Median = 4 (IQR 4,6)	<0.0001
Yawn 2021 <sup>14</sup>	Retrospective Review	95	n = 95	Perioperative pathway	Conventional perioperative care	4.226 +/- 0.3026	4.031 +/- 0.3036	0.66

**Table 2:** The intervention group experienced significantly reduced postoperative LOS compared to the control group.<sup>12,13</sup> ERAS, Enhanced Recovery After Surgery; LOS, length of stay

## Conclusions

- There is **limited available data** regarding the use and efficacy of ERAS protocols in reducing postoperative LOS in VS patients undergoing elective craniotomy for tumor resection
- The development of a formal ERAS pathway for VS patients demonstrates the potential to improve postoperative outcomes

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