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ORIGINAL ARTICLE

Anesthesia Experience for Guillain-Barre Syndrome in Endoscopy Procedures: A Retrospective Case Series

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Abstract

Objective: To determine whether patients with previous Guillain-Barre syndrome (GBS) encountered anesthetic complications that necessitated an unanticipated escalation of care during endoscopic procedures.

Patients and Methods: We reviewed 309 patients diagnosed with GBS who underwent 537 gastrointestinal endoscopic procedures at all Mayo Clinic geographic sites from January 1, 2012 to May 25, 2023. Our study included patients with GBS from acute onset, chronic/relapsing to full/partial recovery phases. We assessed whether GBS correlated with unanticipated escalations of care, defined as intraprocedural escalation between types of sedation or unanticipated hospital admission after an endoscopic procedure.

Results: No case exhibited anesthesia-related complications or required escalations of care. A total of 85% of cases (458) were performed without a secured airway. Within 6 months of GBS acute onset, 61% of cases (16 of 26) required general endotracheal anesthesia. Nine of 26 acute onset cases involved patients already intubated or with tracheostomies, primarily to place percutaneous endoscopic gastrostomy feeding tubes to advance care outside of the intensive care unit. 33 cases received paralyzing doses of succinylcholine; 3 involved patients with reported residual muscle weakness.

Conclusion: Acute onset GBS cases frequently present with bulbar dysfunction, respiratory distress, and muscle weakness. Patients within 6 months of acute onset should delay elective endoscopic procedures, whereas urgent/emergent ones should be scheduled on a case-by-case basis. Beyond 6 months, most patients exhibit dramatic functional recovery, allowing for administration of sedation without a protected airway. Regardless of time since onset, residual GBS symptoms—particularly respiratory distress and bulbar dysfunction—can help risk stratify patients for periprocedural aspiration risks.

Guillain-Barre syndrome (GBS) affects 1-2 per 100,000 individuals annually. Its clinical presentation, pathophysiology, treatment, and progression are well documented.[1-7] Despite several case reports detailing succinylcholine-induced, life-threatening hyperkalemic cardiac arrhythmias, anesthesia-specific research on GBS remains sparse. Even less is known about this population when undergoing endoscopic procedures. Acute onset GBS often involves severe residual muscle weakness, bulbar dysfunction, or respiratory distress requiring intubation and intensive care unit recovery. Most patients make a dramatic recovery, but not everyone returns to full function. Anesthesiologist's or certified registered nurse anesthetist (CRNA's) lack of awareness on how best to manage patients with GBS, combined with high volume production pressures in endoscopy suites, may increase adverse event risks for this low incidence affected population.

PATIENTS AND METHODS

The investigational review board determined that their approval was unnecessary because this study was done for quality improvement purposes.

The anesthesia clinical research unit (ACRU) searched Mayo Clinic patient data set according to a listing of predefined International Classification of Disease (ICD) codes

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that represent GBS, acute inflammatory demyelinating polyneuropathy, chronic inflammatory demyelinating polyneuropathy, Landry-GBS, polyneuritis, and Miller Fischer syndrome. The ACRU cross-referenced flagged records against clinical notes with text containing the aforementioned ICD codes. Only charts that contained both ICD code and references to GBS diagnosis in at least 1 clinical note were included in the case series. The ACRU subsequently matched the aforementioned records against upper or lower endoscopic procedures ranging from January 1, 2012 to May 5, 2025. We excluded patients who declined the Mayo research participant waiver.

We reviewed patient charts, focusing in on GBS history, symptomology, and anesthesia details. We classified anesthesia type as conscious sedation (CS), monitored anesthesia care (MAC), or general endotracheal anesthesia (GETA). These classifications do not necessarily imply progressive levels of sedation as laid out in the American Society of Anesthesiologist's Statement on Continuum of Sedation[8]; CS cases may, in some situations, become heavily sedated and approach general anesthesia. In CS cases, the gastroenterologist instructs a nonanesthesia trained nurse to dose sedation,[9] often in the form of versed or fentanyl. No anesthesia certified personnel are present in CS cases, unless an emergency requires an anesthesiologist or CRNA. In MAC/GETA cases, an anesthesiologist or CRNA dose sedation according to the gastroenterologist's case needs and balanced against the patient's unique physiology. In the endoscopy environment, MAC cases often fall in the continuum of general anesthesia; however, there may be specific instances where the patient was too frail and underwent minimal sedation. GETA refers to general anesthesia cases with an endotracheal tube for airway protection. None of the cases reviewed had a supraglottic airway.

We verified patient functional status at the time of GBS diagnosis and at a time of their endoscopic procedure by reviewing notes from primary care teams and from physical, speech, or language therapy notes wherever possible. We recorded whether the patients were admitted to the intensive care unit for GBS, intubated in the intensive care unit for GBS, and whether they exhibited respiratory distress or bulbar or muscle weakness. We captured similar data points regarding patient functional status and GBS symptomology at the time of the endoscopic procedure.

Final, we performed a sub-analysis of GETA cases, focusing on the use of succinylcholine as the paralyzing agent and monitoring for adverse outcomes, specifically hyperkalemic cardiac arrhythmias.

RESULTS

Our initial search yielded 1109 records and 545 unique patients. After excluding patients who declined the Mayo research participant waiver, nonendoscopic cases and non-GBS diagnoses, we analyzed 537 cases and 309 unique patients. See Supplemental Table 1, available online at http://www.mcpiqojournal.org. No anesthesia-related complications resulting in unanticipated escalations of

TABLE 1. Case Count by Anesthesia Type

Procedure	CS	MAC	GETA	Total	% of total
Colonoscopy	141	87	2	230	43%
EGD	71	125	36	232	43%
Double: EGD, C-scope	19	9	1	29	5%
EGD w/Trach/NGT/PEG/enteroscopy	-	1	12	13	2%
ERCP	-	5	28	33	6%
Total	231	227	79	537	100%
% of total	43%	42%	15%	100%	

CS, conscious sedation; EGD, esophagogastroduodenoscopy; ERCP, endoscopic retrograde cholangiopancreatography; GETA, general endotracheal anesthesia; MAC, monitored anesthesia care; NGT, nasogastric tube; PEG, percutaneous endoscopic gastrostomy.

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TABLE 2. Anesthesia Type by Case Timing—GBS Diagnosis to Procedure

Case timing	CS	MAC	GETA	Total	% of total
<6 mo	5	5	16	26	5%
6-12 mo	5	6	4	15	3%
1-2 y	25	20	5	50	9%
2+ y	195	192	53	440	82%
NA	1	4	1	6	1%
Total	231	227	79	537	100%

CS, conscious sedation; GETA, general endotracheal anesthesia; MAC, monitored anesthesia care; NA, not available.

care (CS to MAC, MAC to GETA, or unanticipated hospital admission) occurred.

Tables 1, 2, and 3 summarize the data by case count, type of anesthesia, timing from GBS diagnosis to procedure, and indications for GETA. We chose a 6-month demarcation time to approximate recovery from GBS acute onset to recovery for roughly 80% of GBS recovered patients.[4] The GETA cases performed within 6 months of GBS diagnosis were acute onset, almost exclusively in intensive care settings, and required to advance the patient's care often as a tracheostomy or percutaneous endoscopic gastrostomy procedure. The CS and MAC cases within 6 months of GBS diagnosis were urgent or emergent cases, often due to lower gastrointestinal bleeding or concern for colon cancer. Four CS and MAC cases performed within the six-month time frame, had residual muscle weakness primarily in the lower extremities, however none of these CS or MAC cases had residual bulbar weakness or respiratory distress. The anesthesiology team intubated 1 colonoscopy case roughly one year after acute onset due to bulbar weakness though the patient did not have respiratory distress; this single case inspired this retrospective case series.

Table 4 summarizes case counts by patient symptomology and functional status at the nadir of GBS diagnosis and at the time of endoscopic procedure, respectively. Despite intensive chart review, there were still gaps in information regarding patient functional status around the time of GBS diagnosis because many of these cases predated the advent of electronic medical records; we recorded these gaps as NA or not available.

Table 5 summarizes the type of paralytic used in GETA cases. Of the 79 GETA cases, 33 used succinylcholine as the intubating paralytic, with the average dose being 97.6 mg intravenously (max 200 mg, min 40 mg, and average 1.33 mg/kg). All 33

TABLE 3. Indications for GETA by Case Timing[a]

Case indication	<6 mo	6-12 mo	1-2 y	2+ y	NA	Total
GBS-specific reasons[b]	9	-	1	-	-	10
ERCP	4	3	2	19	-	28
GI bleed	1	1	-	10	-	12
Achalasia	-	-	1	4	-	5
Food impaction	-	-	-	4	-	4
Enteroscopy	-	-	1	3	-	4
Other	2	-	-	13	1	16
Total	16	4	5	53	1	79

EGD, esophagogastroduodenoscopy; ERCP, .endoscopic retrograde cholangiopancreatography; GI, gastrointestingal; PEG, percutaneous endoscopicgastrostomy.

[a]GBS, Guillain-Barre syndrome; GETA, general endotracheal anesthesia; NA, not available.

[b]Often already intubated or trach. EGD/PEG most common procedure if <6 months.

TABLE 4. Worst Functional Status from GBS Symptoms

	Around time of diagnosis					Procedures done >6 mo from GBS diagnosis			
Count	ICU GBS	Respiratory distress	Bulbar weakness	Motor weakness	Intubated for GBS	Respiratory distress	Bulbar weakness	Motor weakness	Intubated for GBS
Yes	54	65	58	368	48	4	1	64	1
No	373	362	359	68	380	507	510	447	510
NA	110	110	120	101	109	-	-	-	-

GBS, Guillain-Barre syndrome; ICU, intensive care unit; NA, not available.

succinylcholine cases were GBS non-acute onset. The anesthesiology team gave succinylcholine in 3 patients with residual muscle weakness. Despite the traditional contraindication for succinylcholine due to hyperkalemic risk, our review did not find any adverse events related to its use.

DISCUSSION

This study represents the largest anesthesia-focused analysis of patients with GBS undergoing endoscopic procedures. Much of the anesthesia GBS literature extrapolates from a multitude of case reports that describe life-threatening, hyperkalemic cardiac arrhythmias induced by succinylcholine in patients with GBS. Though we did not find any complications that required escalations of care, either from succinylcholine or other causes, given the paucity of anesthesia-specific literature for endoscopic procedures, our study findings may be useful to anesthesiologists, gastroenterologists, and neurologists as patients with GBS prepare for their endoscopic procedures and may serve to both alleviate patient concerns and identify GBS-specific issues to address. As noted in Table 4, the incidence of GBS symptoms, a marker of recovery, dramatically reduces after 6 months of acute onset; however, risk of residual symptomology can remain past this period.

TABLE 5. GETA Cases by Paralytic Class[a]

Paralytic	Cases	% of total
Succinylcholine[b]	33	42%
Other paralytics	22	28%
Type of paralytic not available	24	30%
Total	78	100%

[a]GETA, general endotracheal anesthesia.
[b]Three cases had residual muscle weakness at the time of succinylcholine administration.

Selecting an appropriate anesthetic strategy in the endoscopic suite involves a multitude of inputs and decisions. At this health system, there is a preprocedural process that identifies high risk patients, including patients with GBS, for evaluation before scheduling. Typically, Mayo Clinic postpones elective endoscopy cases for patients with GBS for ~6 months from diagnosis to allow for symptom resolution. Furthermore, on the day of procedure, each patient undergoes a preoperative anesthesia evaluation, which reviews a patient's medical history, current functional status, the risk for periprocedural aspiration or respiratory distress, and anticipated procedural needs. Although the above often redundant processes should not be unique to this health system, their importance cannot be overstated.

Given the low incidence of GBS, medical professionals may not readily recall how best to evaluate, plan, and care for this patient population, especially in a high production endoscopy environment. In the intensive care unit, when GBS is often acute onset, intensivists associate GBS with respiratory distress and bulbar weakness and will secure an unstable airway. Roughly 80% of patients with GBS return to full functionality after 6 months, some have a partial return to full function, and others never return to full function; in other words, roughly 20% of patients with GBS may still have symptomology that may place the patient at risk for aspiration during endoscopy procedures. On the basis of this information, we suggest posing the following questions before the endoscopic procedure: When were you diagnosed with GBS? Were

you ever admitted to the intensive care unit? Were you in the intensive care unit specifically for GBS? Were you intubated specifically for GBS? Did you ever have respiratory distress from GBS? Did you ever have bulbar dysfunction from GBS? Did you ever have muscle weakness from GBS? Today, are you having respiratory distress, bulbar or muscle weakness? The more affirmative responses, particularly on the day of endoscopic procedure, the more likely the patient will need an endotracheal tube.

Interestingly, we recorded 33 GETA cases where succinylcholine, a depolarizing muscle paralytic, was administered. Three patients had residual muscle weakness from GBS. This is a peculiar finding because traditional anesthesia teaching recommends against the use of succinylcholine because this drug may activate extrajunctional neuromuscular receptors and cause life-threatening hyperkalemic cardiac arrhythmias, particularly when administered 2-3 days after an acute onset.[10-13] It is thought these up-regulated extrajunctional receptors can persist for up to 2 years after acute onset. As with all cases reviewed in this study, no periprocedural complications were observed, and consequently no subsequent laboratory reports were drawn. We do not assert succinylcholine use in patients with GBS would be safe; however, we would highlight current guidance is heavily skewed by relatively few, though horrific case reports. We acknowledge concerns for patient safety would likely preclude a prospective randomized controlled trial. We would have anticipated marked reductions in succinylcholine use since U.S. Food and Drug Administration approval of Sugammadex in 2015; however, as noted above, succinylcholine was used 33 times in this study period. Regarding the 3 cases of succinylcholine use in residual muscle weakness, Sugammadex was available, but it is unclear why it was not used in conjunction with a nondepolarizing muscle relaxant.

There are several limitations regarding this study. This is a retrospective study and is limited by the medical records selected for review, accuracy of these medical records, interpretation of the records, and the inability to control different study groups. Classification of and distinguishing between sedation levels according to the American Society of Anesthesiologist's Statement on Continuum of Sedation was problematic. Gastroenterologists instructing CS may actually achieve high levels of sedation; and conversely in MAC cases, anesthesiologists or CRNAs may choose to simply observe extremely frail patients with minimal sedation. Such sedation classifications are difficult to clarify unless observing directly as patients may have variability in their dosing response. Furthermore, while this study is the largest anesthesia study regarding patients with GBS undergoing endoscopy procedures, it still lacks statistical power to drive any conclusions. Unfortunately, extending the study time frame further back into history will push this research into paper chart review, and gathering data past May 25, 2023 and into the future would yield only incremental, though potentially useful, data. Instead, it may be useful to repeat this study in 5 or 10 years time.

This is a negative retrospective case series regarding our anesthesia experience for patients with GBS in the endoscopy suite. Whether from our health system's current processes or the anesthesia provider's intraprocedural skills, there were no anesthesia complications associated w/GBS regarding endoscopy procedures that required an escalation of care. Patients that are within 6 months of GBS diagnosis should delay elective endoscopic procedures, and urgent or emergent procedures should be scheduled on a case-by-case basis. With regards to GBS symptomology at the time of diagnosis, intensivists are likely to intubate patients with active onset GBS symptoms of respiratory distress or bulbar dysfunction; however, these intubation thresholds for aspiration risk are not unique to patients with GBS, nor should they be unique to patients undergoing elective endoscopic procedures.

POTENTIAL COMPETING INTERESTS

Dr Klein reports consulting fees from Takeda Pharmaceuticals (CIDP therapies), Sangamo Therapeutics (CIDP therapies), and WR medical (developer of hand held heat/cold testing). The other authors report no competing interests.

ETHICS STATEMENT

The investigational review board determined that their approval was unnecessary because this study was done for quality improvement purposes.

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SUPPLEMENTAL ONLINE MATERIAL

Supplemental material can be found online at http://www.mcpiqojournal.org. Supplemental material attached to journal articles has not been edited, and the authors take responsibility for the accuracy of all data.

Abbreviations and Acronyms: **ACRU,** anesthesia clinical research unit; **CRNA,** certified registered nurse anesthetist; **CS,** conscious sedation; **GBS,** Guillain-Barre syndrome; **GETA,** general endotracheal anesthesia; **ICD,** International Classification of Disease; **MAC,** monitored anesthesia care

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