Intraoperative Neurophysiological Monitoring (IONM) Alerts In 2,599 Lumbar Surgeries

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Introduction

IONM or Intraoperative Neurophysiological Monitoring has been used in surgical procedures where the functional integrity of the nervous system is at risk. More recent studies have shown the benefits of IONM in lumbar surgeries. Our data shows the incidence of different alerts in various types of lumbar surgeries utilizing IONM.

Methods

We performed a retrospective analysis of IONM data of 2,599 extradural lumbar surgeries performed between January 2019 to March 2021 (1304-50.2% males/1295-49.8% females ; ages 6-89 years, median 52 years). We identified events caused by:

- Surgical factors, and
- Non-surgical factors
  - *anesthesia,*
  - *positioning,*
  - *technical,*
  - *interpreting physician, and*
  - *internet*

Within the category of surgical events, we further classified them by the modality in which they occurred. Surgical events were categorized by changes in neurophysiological signals that required intraoperative intervention, a surgical pause, or other efforts to prevent any neurological injury.

The aims of the study were to determine the following:
- Most common alert type; anesthetic/physiological, positioning, or surgical
- Type of surgical approach with the highest incidence of alerts
- Modality with the highest incidence of alerts

The Pearson correlation analysis was performed using SPSS 27.

Results

1,072 total events occurred within the 2,599 surgeries. A single surgery may have more than one event.

| Anesthesia: 227 | Positioning: 203 | Surgical: 642 |

EMG activity occurred in approximately 75% of the cases with surgical events. EMG included lateral lumbar T-EMG navigation and S-EMG alerts in procedures.

651 of the events were resolved by closing. 145 were not resolved by closing, and 74 were alerts (such as T-EMG navigation) where the modality resolution was not applicable.

Surgical Approach

- The lateral lumbar surgeries had the highest incidence of surgical alerts at 21.3%.
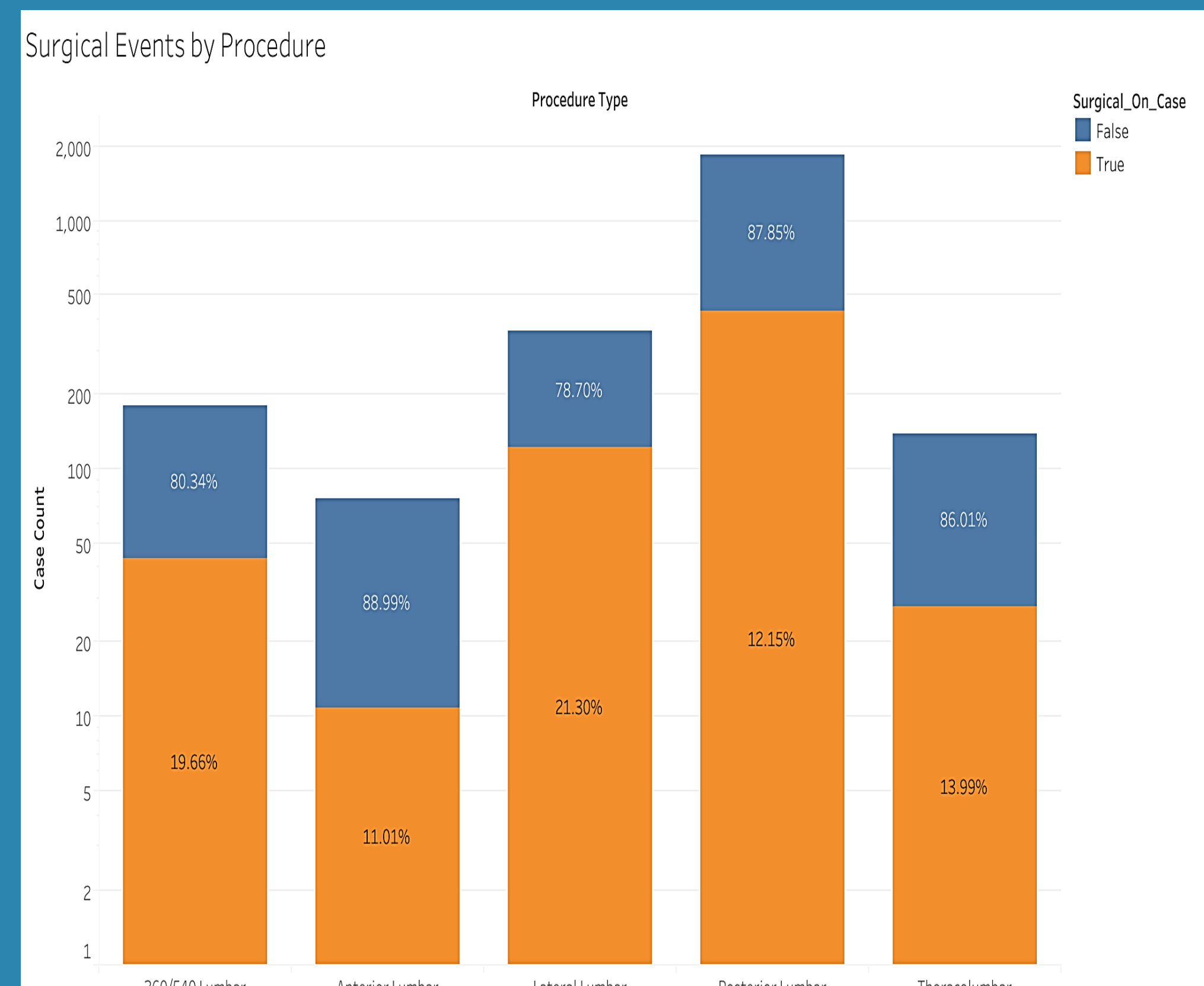- The anterior lumbar surgeries had the lowest incidence of surgical alerts at 11.01%.

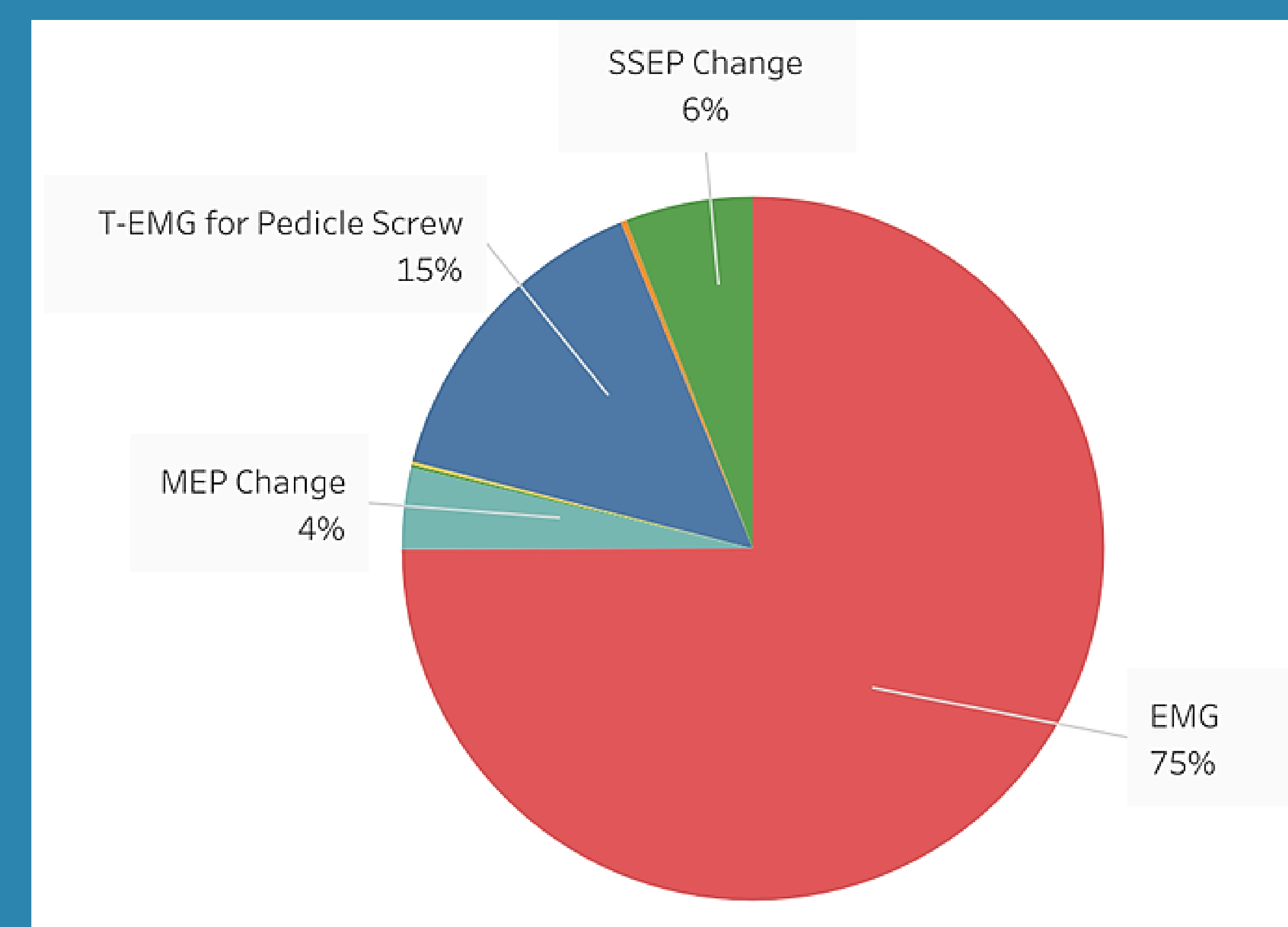Fig1: The breakdown of the likelihood of a surgical event occurring based on the surgical approach .

Fig 2. Incidence of Events in Lumbar Surgeries

Conclusion

- According to our data, **surgical events** were the most common type of alerts.
- The most common modality with alerts was **EMG** that shows that surgical events detected by EMG were the primary occurrence within lumbar procedures in this data.
- Further research is required to determine whether anesthesia, technical experience, and patient history will impact the likelihood that an event occurs during a lumbar procedure.
- An outcome comparison between IONM and non-IONM patients, and a method of grading the relevance of specific events detected by IONM would advance our understanding of how these events relate to the prevalence of post-operative deficits.
- IONM assists the surgical team in preventing post-operative neurological deficits. Many potential post-operative neurological deficits were able to be resolved intraoperatively with IONM.

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