

Thoracic Epidural Catheter Placement Failure Rate by Contrast Epidurography: A Single-Center Retrospective Study

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Introduction

- Epidural anesthesia is a neuraxial technique in which anesthetic medications are administered into the epidural space to block the spinal nerve roots of sensory and motor nerves that supply the thoracic, abdominal, pelvic, and lower extremity regions.
- Thoracic epidural catheters are commonly used as adjuncts for postoperative pain management in thoracic and abdominal procedures, and are typically performed “blind” using anatomic landmarks and loss-of-resistance technique to access the epidural space.
- Contrast epidurography is a diagnostic imaging modality which uses contrast dye and fluoroscopy to verify the placement of a catheter within the epidural space, and can provide objective data regarding the success or failure of epidural catheter placement compared to other techniques which involve subjective patient feedback.
- Primary epidural failure rates vary widely in the literature, from 2.1-26% in recent studies. Only one prior study has reported a failure rate based on contrast epidurography, and this study was small (n=53).
- Our study will aim to assess the failure rate of initial thoracic epidural catheter placement, as defined by contrast epidurography, in a larger single-center study where contrast epidurography is the standard of care.

Materials and Methods

- Epidurograms were retrospectively reviewed for all patients who underwent contrast epidurography for confirmation of thoracic epidural catheter placement at Virginia Mason Franciscan Health between 2017-2024, and were used to determine whether placement of an epidural catheter was successful.
- Epidurograms were reviewed by board-certified anesthesiologists from the Virginia Mason Anesthesiology Department with fellowship training in chronic pain.
- An epidural was considered successful based on characteristic patterns of contrast spread within the epidural space, including a “honeycombing” pattern of contrast between epidural fat globules and contrast contained within the boundaries of the pedicles.
- The data was analyzed to determine the success rate of first-attempt thoracic epidural catheter placement.
- Second attempt rescue epidurals were excluded from this study.

Results

- From 2017 to 2024, there were a total of 1,372 initial attempts at thoracic epidural catheter placement; of those, 1,155 were successfully placed in the epidural space as determined by contrast epidurography, yielding a cumulative success rate of 84.2%.
- Success rates were further stratified by year, with 2020 being the most successful year (87.9% success rate) of thoracic epidural catheter placement over this time period (Table 1).

Year	# Successful Epidural	# Failed Epidural	# Unclear Epidurals	Total Epidural	Success Rate	Validation
2017	121	28	12	161	75.2%	161
2018	125	28	4	157	79.6%	157
2019	208	21	8	237	87.8%	237
2020	182	21	3	207	87.9%	206
2021	188	28	4	220	85.5%	220
2022	161	26	2	189	85.2%	189
2023	127	19	3	149	85.2%	149
2024	43	9	0	52	82.7%	52

Table 1. Yearly success rate of first-attempt thoracic epidurals as determined by contrast epidurography.

References

1. Avila Hernandez AN, Hendrix JM, Singh P. Epidural Anesthesia. [Updated 2024 Feb 2]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK542219/>
2. Coleman JR, Hartmann P, Kona M, *et al.* Use of epidurography in the perioperative and acute pain setting. *Regional Anesthesia & Pain Medicine* 2022;**47**:445-448.
3. Tran Q, Booyesen K, Botha HJ. Primary failure of thoracic epidural analgesia: revisited. *Reg Anesth Pain Med.* 2024;**49**(4):298-303.
4. Parra MC, Washburn K, Brown JR, *et al.* Fluoroscopic Guidance Increases the Incidence of Thoracic Epidural Catheter Placement Within the Epidural Space: A Randomized Trial. *Reg Anesth Pain Med.* 2017;**42**(1):17-24.

Discussion

- Thoracic epidurals are a useful technique for managing postoperative thoracic and abdominal pain.
- Epidural catheter placement is typically performed as a blind technique, and contrast epidurography may be used to objectively evaluate the failure rate of epidural catheter placement.
- The data obtained in this large single-center study provides a database to quantify the failure rate of first-attempt thoracic epidural placement.
- The researchers in this study plan to further analyze this data to evaluate secondary outcomes, including success rates stratified by supervising anesthesiologist subspecialty training and operator year of training.
- Future research should aim to determine if contrast epidurography helps guide management of thoracic epidural catheters.

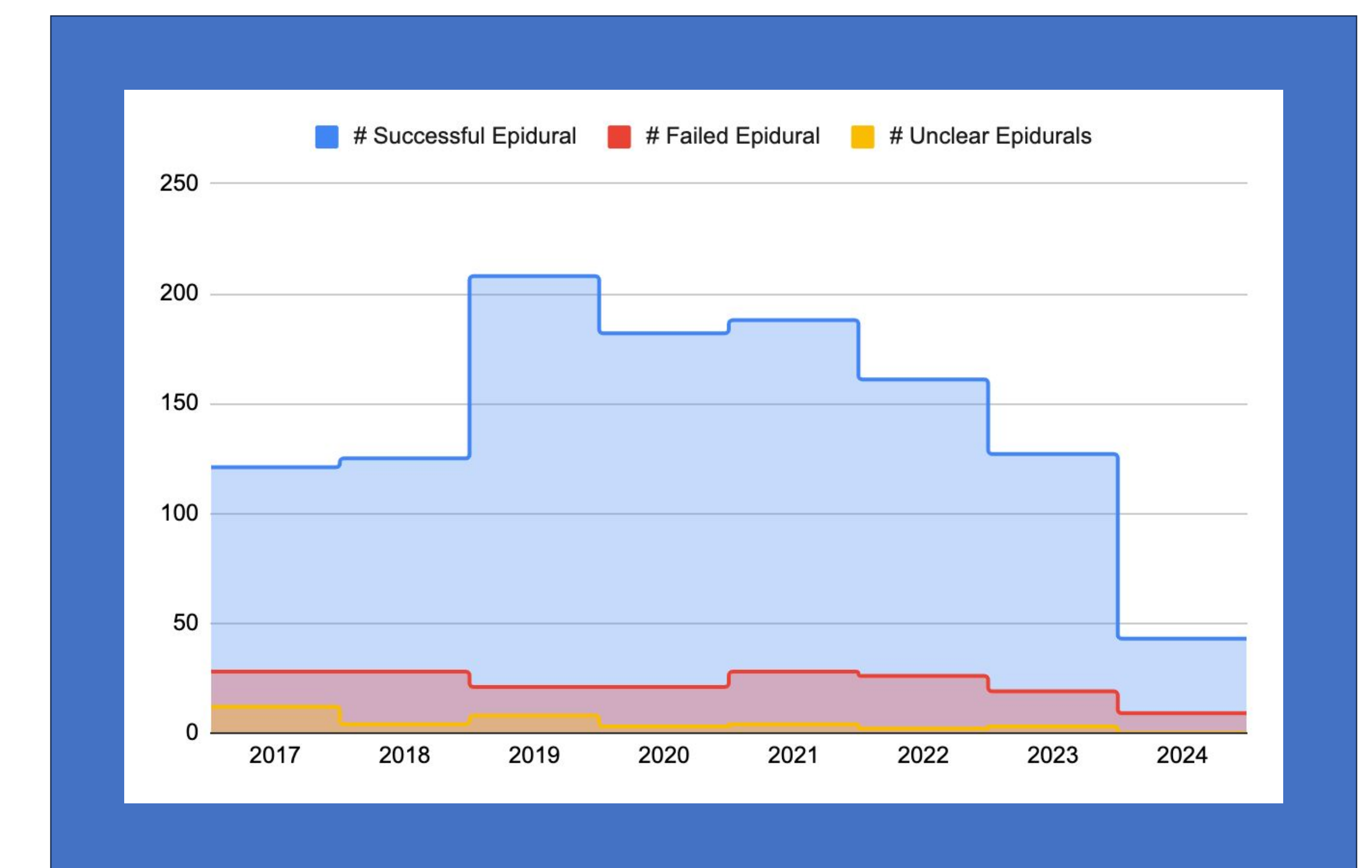


Figure 1. Graph of epidural success rate by year as determined by contrast epidurography.