

PREDICTING TIMELINE OF EXPECTED POSITIVE RESPONSE TO EPIDURAL STEROID INJECTION FOR RADICULAR LOW BACK AND NECK PAIN

VALENTINE CHUKWUMA, MD, PHD ● BYRON SCHNEIDER, MD

INTRODUCTION

- The use of an epidural steroid injection (ESI) for the treatment of radicular pain has been well documented
- There is no consensus among providers on exactly when a patient will have >50% relief following an ESI
- There are no published studies where consecutive patients have been followed to identify the timeline of a patient's response after an ESI
- In this study, we sought to describe a patient's clinical response in terms of pain following an ESI by meticulously following consecutive patients approximately every 3 days for 3 weeks

MATERIALS AND METHODS

- The study was approved by the Institutional Review Board at Vanderbilt University Medical Center (VUMC) in Nashville, Tennessee, and performed in accordance with the code of ethics of the World Medical Association for experiments involving humans. Informed consent was obtained from all research participants
- Consecutive patients aged 18 years or older who underwent an ESI at VUMC from January 2020 through June 2020 were recruited to be enrolled in this study
- Patients who received an ESI within six months or any steroid injection within two months prior to study enrollment were excluded
- Those patients who had a repeat ESI during their data collection and patients with several consecutive follow-up days of incomplete data were subsequently excluded.
- All procedures were performed by fellowship-trained spine or pain providers with extensive experience in performing spinal interventions
- Pre- procedure and post-procedure scores were obtained from each patient using an 11-point numerical rating scale (NRS) from 0 to 10; with 0 describing no pain, and 10 describing excruciating pain, and each patient was contacted by phone or email the day after the ESI, and every 3 days +/- 1 day for 21 days post-ESI to assess pain as measured via the NRS and subjective percentage pain relief question

1) On a scale of 0 - 10, with 0 being no pain and 10 being your level of pain before the injection, how would you grade your pain today?

2) On a scale of 0% - 100%, with 0% being no reduction and 100% being complete relief, how much relief do you currently have from your pain before the injection?

RESULTS

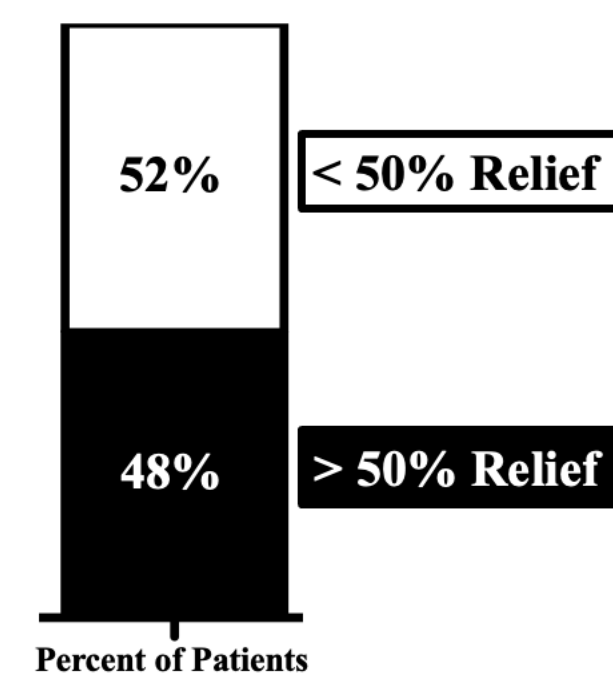
Figure 1: Enrollment Data

- 116 out of the 134 consecutive patients who met inclusion criteria responded to the phone calls or emails and were enrolled in the study
- Data from 110 patients was included in the final analysis after the exclusion of patients who had a repeat ESI during data collection or significantly incomplete data



Figure 2: ESI Outcome Rate

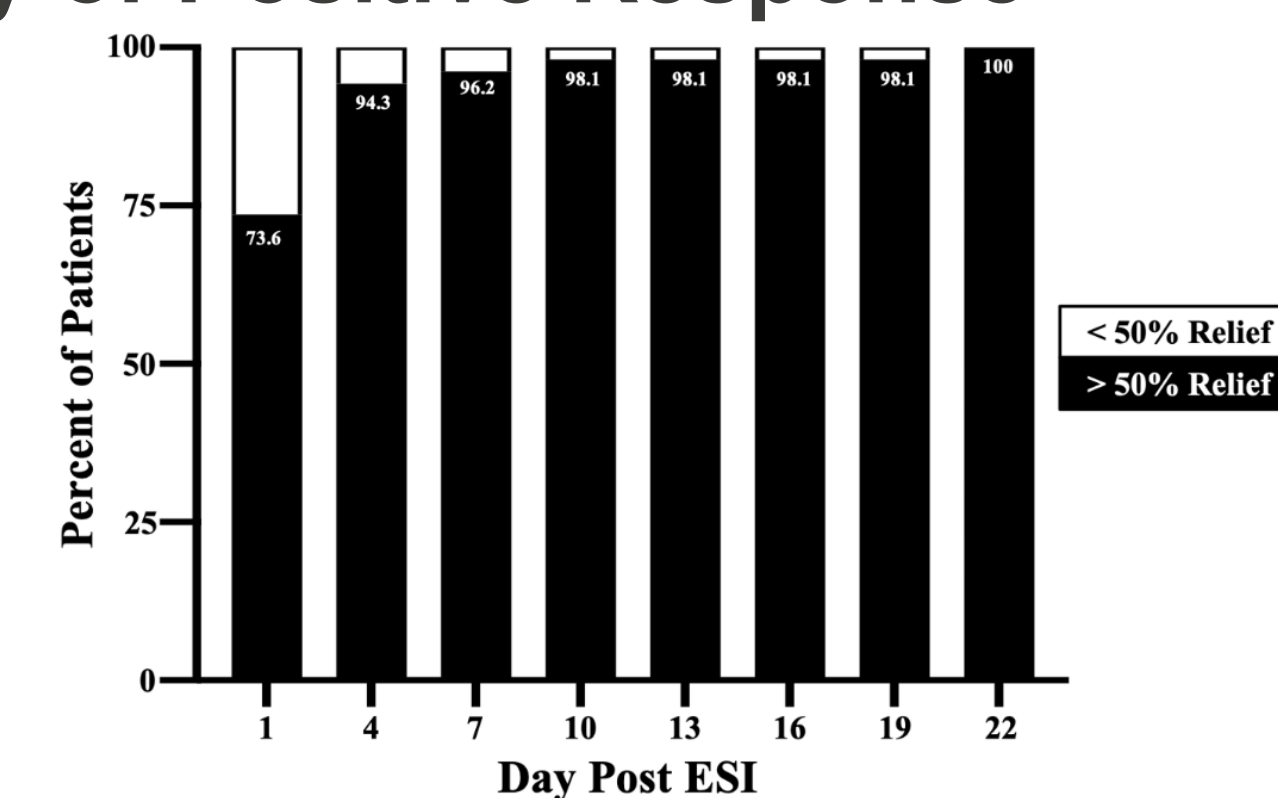
- A positive response was defined as a patient reporting a > 50% reduction in the patient's pain index



- 53 patients (48%) achieved a sustained positive response, while 57 patients (52%) did not achieve a sustained positive response

Figure 3: Day of Positive Response

Patients reporting sustained positive response



- 73.6% first reported a positive response on day-1
- The percentage increased to 94.3% on day-4
- Further increasing to 96.2% on day-13, 98.1% on day-16, and 100% on day-22

Table 1: Demographics

Category	Number (%)
Age (years)	
< 30	9 (7.76)
30 - 65	84 (72.41)
> 65	23 (19.83)
Level of injection	
Cervical	21 (18.10)
Lumbar	62 (53.45)
Sacral	23 (19.83)
Other	10 (8.62)

- Patient ages ranged from 18 to 84
- Majority of injections performed:
 - cervical (n=21)
 - Lumbar (n=62)
 - Sacral (n=23)

Figure 4: Response Predictor

- Positive or negative responses on a particular follow-up day along with positive or negative response on day-22
- Positive likelihood ratio at follow-up day-1, day-4, day-7, and day-10 was 2.2, 5.1, 7.8, and 43.0 respectively
- Negative likelihood ratio at follow-up day-1, day-4, day-7, and day-10 was 0.4, 0.2, 0.2 and 0.3 respectively

	Day 22	
	Positive	Negative
Day 1	Positive 39	Negative 19
	Negative 14	Negative 38
Positive Likelihood Ratio 2.21		Negative Likelihood Ratio 0.4
Day 4	Positive 44	Negative 9
	Negative 9	Negative 46
Positive Likelihood Ratio 5.07		Negative Likelihood Ratio 0.2
Day 7	Positive 44	Negative 6
	Negative 9	Negative 50
Positive Likelihood Ratio 7.75		Negative Likelihood Ratio 0.19
Day 10	Positive 40	Negative 1
	Negative 13	Negative 56
Positive Likelihood Ratio 43		Negative Likelihood Ratio 0.25

DISCUSSION

- The optimal timing for assessment of a patient's response to an ESI has not been well elucidated, and there is no consensus among providers about when a patient will achieve at least 50% relief after an ESI
- Some providers recommend waiting up to 2-weeks after an ESI to assess a patient's response, but this timeline is based on expert opinion as there are no published studies with a definitive recommendation
- In this prospective study of consecutive patients receiving an ESI, there was an approximate 1:1 ratio of responders to non-responders which is consistent with previous findings
- About 94% of responders had reported a positive response by day-4, indicating that >90% of positive responders achieve this response by day-4
- Given the baseline odds of ~1:1 for success to failure at three weeks, the positive likelihood ratio of 5.2 on day-4 is indicative of a 5:1 odd of a positive response at 3 weeks
- This corresponds to 5 successful outcomes for every 1 negative outcome or an 83.3% chance of a successful outcome if positive by day 4
- These odds, positive likelihood ratio, and probability increased with time from the injection
- Conversely, the negative likelihood ratio of 0.2 on day-4 is indicative of a 1:5 odd of a negative response. This corresponds to 1 negative response that eventually becomes positive at 3 weeks for every 5 negative response that remains negative at 3 weeks. This corresponds to a 16.7% chance of a positive response at 3 weeks if negative by day 4
- These odds, negative likelihood ratio, and probability remained relatively stable with time from the injection
- These findings are important clinically because they show that providers do not need to wait for up to two weeks to assess the success or failure of an ESI

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