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Evaluation of the role of Erector Spinae Plane Block versus conventional medical therapy in the management of Acute Thoracic Herpetic Neuralgia and the degree of patient satisfaction

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Abstract:

Background: **Acute herpetic neuralgia (AHN) markedly impacts patients' functional level and quality of life, resulting in elevated health service consumption. Modern interventional therapies for acute herpetic neuralgia encompass epidural injections, paravertebral blocks, intercostal nerve blocks (ICNB), and erector spinae plane blocks (ESPB). This study sought to assess the efficacy of ESPB and conventional medical treatment in the management of AHN and the prevention of post-herpetic neuralgia (PHN).** ***Aim:*** **To improve pain treatment for acute herpetic neuralgia and limit the likelihood of developing PHN.** ***Methods:*** **Thirty patients with acute herpetic neuralgia, aged 18 to 60, classified as ASA I and II, were recruited and randomly assigned to two groups: control and ESPB. Pain in the ESPB group was evaluated using VAS scores at 1 hour, 24 hours, 2 weeks, 4 weeks, and 12 weeks post-intervention, and total analgesic usage was documented.** ***Results:*** **The ESPB group exhibited the lowest values in VAS measurements at rest and during movement ($p < 0.001$). Significant differences were observed. Pain resolution time also varied considerably ($p < 0.001$), with an average of 12.93 ± 0.26 days for the medical group and 7.27 ± 5.06 days for the ESPB group. In addition, the medical group had a substantially higher gaptin administration (9.87 ± 1.41 weeks) than the ESPB group (5.07 ± 0.8 weeks) ($p < 0.001$).** ***Conclusion:*** **ESPB acts as an effective adjunct to conventional treatment for acute thoracic herpetic neuralgia.**

Keywords: Herpetic neuralgia, ESPB, PHN, Gaptin.

Introduction:

Herpes zoster (HZ) is the Varicella Zoster virus reactivating, affecting the sensory ganglia and causing painful skin blisters. Acute herpetic neuralgia (AHN) is a serious condition, and having pain for a long time makes it more likely to come back [(1)]. Post Herpetic Neuralgia can cause radiculopathy and corresponds to the dermatomal distribution of the HZ rash [(2)].

It has been shown that treating acute herpetic neuralgia with antiviral medication and a combination of analgesic techniques will lessen neural sensitization and postherpetic neuralgia [(3)]. This method uses epidural and nerve blocks along with nonsteroidal anti-inflammatory medications, gabapentin, opioids, anticonvulsants, and antidepressants [(4-7)].

A popular regional anesthetic method, ultrasound-guided erector spinae plane block (ESPB) is renowned for its safety, simplicity of use, and being away from vascular and neuronal structures [(8)]. Significant analgesia can be achieved with

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a single needle insertion in prone, lateral decubitus, or sitting positions [9]. When it comes to post-herpetic neuralgia, ESPB is a safe adjunct therapy [10,11].

There is ongoing discussion over the best regional analgesia for AHN. Few prospective trials have contrasted interventional pain management techniques with traditional medical treatment for analgesia, despite the need for a less invasive and more effective strategy. In order to treat acute herpetic neuralgia and prevent PHN, this study compares ESPB, a novel therapy, with traditional medical treatment.

Patient and methods:

The sample size was calculated at a signifiant level of 5 % where p-value was significant if less than 5% and an error value of 20% [19]. The estimate of the standard deviation of Numeric Rating Scale (NRS) = 2.4, the mean NRS at week 12 in the ESPB group = 1.4 and the mean NRS at week 12 in the control group = 5.4. So, by calculation, the sample size was 14 patients per group, by the addition of a 10% drop-out proportion, each group was composed of 15 patients, and the total sample size was 30 patients [18].

The sample size was calculated using the following formula:

$$n = 2\left[\frac{\left(Z_{\alpha/2} + Z_{\beta}\right) * \sigma}{\mu_1 - \mu_2}\right]^2$$ (Dawson and Trapp, 2004)

Where:

n = sample size

$Z_{\alpha/2}$ = 1.96 (The critical value that divides the central 95% of the Z distribution from the 5% in the tail)

Z_{β} = 0.84 (The critical value that separates the lower 20% of the Z distribution from the upper 80%)

σ = the estimate of the standard deviation of Numeric Rating Scale (NRS) = 2.4 (Hacıbeyoğlu *et al.*, 2020)

μ_1 = mean NRS at week 12 in the ESPB group = 1.4 (Hacıbeyoğlu *et al.*, 2020)

μ_2 = mean NRS at week 12 in the control group = 5.4 (Hacıbeyoğlu *et al.*, 2020)

So, by calculation, the sample size was 14 patients per group, by the addition of a 10% drop-out proportion, each group was composed of 15 patients, and the total sample size was 30 patients. (Hacıbeyoğlu *et al.*, 2020)

Using a closed-envelope technique, patients were randomly assigned to one of two equal groups, each consisting of fifteen patients: Group A, which received just traditional medical treatment, and Group B, which received both ESPB and conventional medical treatment. Patients with discomfort and vesicles that started within a week were eligible to be included. People with diabetes mellitus, coagulation issues, mental health issues, a history of local anesthetic allergies, or chronic pain that persisted for more than three months after the rash healed were not included. Acyclovir 800 mg five times a day for seven days, gabapentin 100 mg three times a day titrated in increments of 300 mg/day divided into three doses (maximum 1200 mg/day), and amitriptyline 10 mg per night titrated in increments of 10 mg/day (maximum 75 mg/day) were administered as medical therapy alone to the control group. For VAS ≥4, 1000 mg of acetaminophen (maximum 4 g/day) was used as a rescue analgesic. For 12 weeks, the VAS score was used to adjust the medication's dosage every two weeks until the side effects or pain were intolerable.

Following the first week of medical therapy, the ESPB group received medical management in addition to the block for three weeks in a row. All patients' pain was measured using the VAS score one hour after the block, the first twenty-four hours, two weeks, four weeks, and twelve weeks following the initial appointment. At every visit, the patient's global perception of change (PGIC) was assessed. A high-frequency linear ultrasound transducer was positioned 3 cm laterally to the thoracic spinous process, which corresponds to the afflicted dermatome, while the patient was seated during the ESPB procedure. The hyperechoic transverse process shadow was superficial to the erector spinae, trapezius, and rhomboid major. The tip of a 22-gauge block needle was positioned in the erector spinae muscle-transverse process plane by moving it from cephalad to caudad. Fluid spread was linear after injection. 20 cc of 0.25% bupivacaine plus 8 mg of dexamethasone was the dosage for the local anesthetic. To verify hemodynamic stability and document pain scores one hour after the injection, the patient was observed in the PACU for two hours.

Data management:

Data was analyzed using SPSS version 23 (Statistical Package for Social Sciences) Of IBM Corporation, USA. Quantitative data were displayed in the form of mean ± standard deviation (SD). Qualitative data were demonstrated through figures of frequency and percentage. Student's t-test was used for parametric variables and a Mann-Whitney U test for non-parametric variables. Between groups of qualitative data, a Chi-squared test ($\chi 2$) was used. For statistical significance, a (P-value of < 0.05) was considered.

Results:

In the CONSORT flow chart, thirty patients were included (Figure 1). Regarding age, sex, and BMI, there was no statistically significant difference between the groups

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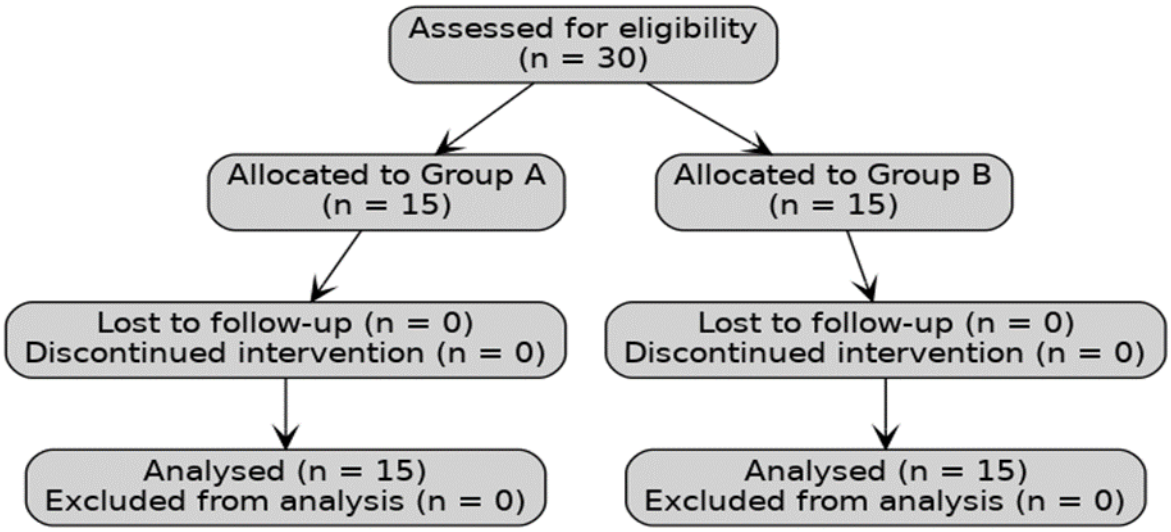

Figure 1: The CONSORT Flow chart of the study

There were statistically significant differences between the study groups in terms of VAS measurements at rest during various time intervals ($p<0.001$), with the

ESPB group showing significantly better overall VAS improvement than the medical group and significantly lower VAS scores than the medical group (Table 1).

Table 1: Visual Analogue Scale (VAS) at rest at different time points.			
Group	Med	ESPB	p-value
VAS just before injection	7.33 ± 1.11	7.67 ± 0.98	0.016[M]
VAS 1-hour after injection	7.4 ± 1.06	1.8 ± 1.21	<0.001[M]
VAS at 24 hours	6.4 ± 1.3	2.8 ± 1.15	<0.001[M]
VAS 2 weeks	4.87 ± 0.83	0.93 ± 0.8	<0.001[t]
VAS 4 weeks	3.8 ± 0.68	0.6 ± 0.74	<0.001[t]
VAS 12 weeks	3.2 ± 1.26	0.2 ± 0.41	<0.001[t]
VAS improvement	-4.2 ± 1.78	-8.13 ± 0.92	<0.001[t]
Tests: t = Independent samples t-test, M = Mann-Whitney U test. p-value is significant if less than 0.05.			

There was a statistically significant difference between the study groups (p<0.001) in the time till complete resolution; the medical-only group's duration was greater than the ESPB group's (12.93 ± 0.26 days vs. 7.27 ± 5.06 days, respectively) (Table 2).

Table 2: Time of complete resolution of pain (days)			
	Medical	ESPB	p-value
Time of complete resolution of pain (days)	12.93 ± 0.26	7.27 ± 5.06	<0.001[M]
M = Mann-Whitney U test. p-value is significant if less than 0.05.			

In terms of VAS measurements on movement at various time points, the block group recorded significantly lower VAS scores on movement at 1-hour post-injection, 24 hours, 2 weeks, 4 weeks, and 12 weeks after injection when compared to the medical-only group. (p<0.001) (Table 3).

Table 3: VAS on movement at the different measurement points of the study			
Group	Med	ESPB	p-value
VAS 1-hour injection on movement	7.93 ± 1.28	2.2 ± 1.26	<0.001[t]
VAS 24 hours on movement	7 ± 1.25	3.33 ± 1.18	<0.001[t]
VAS 2 weeks on movement	5.47 ± 1.13	1.6 ± 0.99	<0.001[t]
VAS 4 weeks on movement	4.4 ± 0.63	1.2 ± 1.08	<0.001[M]
VAS 12 weeks on movement	3.73 ± 1.39	1 ± 0.38	<0.001[M]
VAS on movement improvement	-1 ± 1.36	-4.2 ± 1.93	0.067[M]
Tests: t = Independent samples t-test, M = Mann-Whitney U test. p-value is significant if less than 0.05.			

Between the study groups, there was a statistically significant decrease in the PGIC score after 24 hours and overall improvement, with the ESPB group showing a higher score (p<0.001) (Table 4).

Table 4: Overall patient global impression of change (PGIC) scores at the different measurement points of the study			
Group	Med	ESPB	p-value
Overall PGIC 24hours	4.93 ± 0.88	6.6 ± 0.51	<0.001[t]
Overall PGIC 2 weeks	4.93 ± 0.8	5.67 ± 0.49	0.186[t]
Overall PGIC 4 weeks	5.07 ± 0.96	5.6 ± 1.18	<0.001[M]
Overall PGIC 12 weeks	5.13 ± 1.19	5.6 ± 0.51	0.508[t]
Overall PGIC improvement	-1.4 ± 0.83	0.2 ± 1.32	0.067[M]
Tests: t = Independent samples t-test, M = Mann-Whitney U test. p-value is significant if less than 0.05.			

The two groups' average gaptin administration durations varied significantly (p<0.001), with the medical group's mean length (9.87 ± 1.41 weeks) being higher than the ESPB group's (5.07 ± 0.8 weeks). (Table 5).

Table 5: Average duration of analgesic consumption.			
Group	Med	ES	p-value
Gaptin Duration (weeks)	9.87 ± 1.41	5.07 ± 0.8	<0.001[t]
Acetaminophen Duration (weeks)	9 ± 3.46	7.6 ± 1.84	0.489[t]
Amitriptyline Duration (weeks)	4.73 ± 0.9	4.5 ± 2.12	0.788[t]
Tests: t = Independent samples t-test, M = Mann-Whitney U test. p-value is significant if less than 0.05.			

Three months following the initial visit, there were no statistically significant differences in the incidence of post-herpetic neuralgia across the study groups; the ESPB group showed a lower incidence, with 8 (42%) and 5 (26%) in the medical and ESPB groups, respectively.

Discussion:

In comparison to the group getting solely medical treatment, this study indicated that patients receiving ultrasound-guided ESPB had better pain alleviation, higher patient satisfaction, and lower drug use. The erector spinae plane block (ESPB) demonstrated overall superiority in Visual Analog Scale (VAS) improvement within one week of acute herpes zoster onset, significantly reducing both resting and movement-related pain scores at one-hour post-injection, as well as at 24 hours, 2 weeks, 4 weeks, and 12 weeks following successful block administration.

ESPB showed improved progression and 24-hour PGIC ratings. When compared to the medical treatment, the intervention showed faster pain alleviation and better PGIC scores; this difference was clinically significant. In ESPB, gaptin consumption and duration were considerably decreased. After three months, the ESPB group experienced fewer cases of postherpetic neuralgia without statistically significant difference compared to the control group.

The results are consistent with those of Aydin et al. (2019) and Aydin and Balban (2018), who looked at the effectiveness of ESPB in treating herpes zoster pain and found that using ESPB significantly reduced pain scores. [12,13]

When compared to medical treatment alone, El-Sayed et al. (2021) showed that ultrasound-guided ESPB dramatically

reduced postherpetic neuralgia, medication consumption, pain intensity, duration to resolution, and patient satisfaction [14]

According to Abdelwahab et al. (2022), both paravertebral block (PVB) and epidural steroid block (ESB) successfully treated acute and chronic herpes pain over a six-month period, as evidenced by lower pain Numerical Rating Scale (NRS) scores and lower pregabalin and acetaminophen dosages. [15]

In terms of pain relief time, the ESPB group differed from the medical therapy group in a way that was clinically meaningful. This happened as a result of anesthetics and steroids being infused specifically around certain nerves.

This is in line with research by El-Sayed et al. (2021), who found that the ESPB group experienced much higher patient satisfaction than the control group and that the standard medical treatment group required significantly more time to reach complete pain resolution. [14]

The gaptin administration times for the two study groups varied statistically considerably in the current investigation. The medical group's mean value was nearly 10 weeks, whereas the ESPB group was 5 weeks. Because injectable steroids have an anti-inflammatory effect and lessen nerve discomfort, the medical group required higher doses of gaptin.

According to Ahmed et al. (2022), throughout the third to twelve weeks of follow-up, there was a substantial decrease in the amount of pregabalin and acetaminophen consumed ($P < 0.05$) and an increase in patient satisfaction ($P = 0.03$). [16]

There was no statistically significant difference between the study groups, and the group undergoing erector spinae plane block (ESPB) had a decreased incidence of postherpetic neuralgia (PHN) after three months.

This is consistent with the results of El-Sayed et al. (2021), who found that although the difference was not statistically significant, the incidence of postherpetic neuralgia (PHN) was lower in the ESPB group than in the control group. [14]

Additionally, PVB and ESPB have been shown by Patil et al. (2024) to be useful in reducing acute herpetic neuralgia and averting postherpetic neuralgia (PHN) [17].

Conclusion:

When used in conjunction with normal treatment, ESPB can help patients with acute thoracic herpes zoster by reducing pain, medication, and improving patient satisfaction.

Limitations

This study has a number of limitations, beginning with the small sample size, the brief follow-up period, and the challenge of patient follow-up.

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