Ultrasound Guided Nerve Block in Management of Occipital Neuralgia

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Original Article

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ABSTRACT

Background: Occipital neuralgia (ON) is characterized by chronic occipital headaches that are thought to be caused by irritation or insult to the greater occipital nerve (GON). The use of ultrasound (US) to guide the advancement of needles is becoming increasingly common in chronic pain clinics.

The Aim of the Study: Was to evaluate the effectiveness of the US-guided GON block in the management of ON patients.

Methods: This single-arm interventional study was conducted on 50 patients aged 18 to 70, both sexes, who had ON, scheduled for US-guided nerve block. The pain was measured using the visual analogue scale (VAS), outcomes were measured using the modified Rankin scale (mRS), and patient satisfaction was assessed.

Results: VAS and mRS measurements were significantly lower immediately post-intervention, 1w, and 1m than pre-intervention (P<0.001). Patient satisfaction score was significantly higher immediately post-intervention, 1w and 1m than pre-intervention (P<0.001).

Conclusions: The application of US nerve block holds substantial potential for those affected by ON as it lowers the levels of pain, better outcomes in terms of function as assessed by the MRS and elevates patient satisfaction.

Key Words: Modified rankin scale, nerve block, occipital neuralgia, pain, satisfaction ultrasound.

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INTRODUCTION

Occipital Neuralgia (ON) is a medical condition known for causing persistent headaches in the occipital region. It is thought to occur due to the irritation or damage of the greater occipital nerve (GON)[1]. Headaches are characterized by stabbing or shooting pains that suddenly appear and travel from the suboccipital area to the crown of the head[2].

The current pharmaceutical approach to headache treatment involves the use of anticonvulsants, tricyclic antidepressants, and serotonin reuptake inhibitors[3]. Paracetamol and nonsteroidal anti-inflammatory medications are of negligible importance, as they offer either no relief or only minimal relief to the individual. The introduction and investigation of novel management strategies contribute to the resolution of unresolved issues that are encountered when conventional treatment modalities are employed[4].

Several new diagnostic and treatment modalities have been developed to be minimally invasive and effective, particularly in refractory cases that involve peripheral nerve blocks[5]. This technique offers the benefit of reducing the frequency of attacks and providing pain relief[6].

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A common method for treating headaches that are believed to be caused by occipital neuralgia is the use of GON blocks, which have been the standard diagnostic and therapeutic instrument. The typical procedure for GON blocks involves the injection of a combination of steroids and local anesthetic in close proximity to the GON[7]. The GON extends from the back of the head all the way down the scalp and neck as a division of the second cervical nerve. It continues laterally alongside the nerve before branching off at the level of the inion, the occipital protuberance, where it divides the trapezius muscle and becomes the occipital artery. Nevertheless, its trajectory can vary according to certain anatomical factors[8].

Increasingly, ultrasonography is being utilized in the operating room and pain interventions as a viable alternative to the use of landmarks to guide injections and blocks of a variety of nerves. It is utilized to monitor needle advancement and locate soft tissues in real-time visualization[9].

AIM OF THE STUDY

To evaluate the effectiveness of ultrasound (US)-guided GON block in the management of patients with ON as an alternative to surgical intervention.

METHODS

A single-arm interventional trial was conducted on 50 patients, both sexes, aged 18 years or older, who were scheduled for US-guided nerve block at Kafr El-Sheikh University Hospitals, as well as other private and governmental hospitals.

ETHICAL APPROVAL

The study was performed following the approval of the Ethical Committee Kafr El-Sheikh University Hospitals (Approval Code: KFSIRB200-121). Prior to proceeding, the patient had to provide their signed informed consent.

Exclusion criteria were a history of coagulopathy or uncontrolled hypertension, a history of problems or allergies to steroids or local anesthetics, or a present or past usage of anticoagulant medications.

Each patient underwent a comprehensive evaluation that included a medical history, physical examination, standard laboratory tests, and imaging studies such as cranio-cervical X-ray, computed tomography (CT), and magnetic resonance imaging (MRI).

The US-guided nerve block was performed on all of our patients. The device utilized was a US machine (Vscan Air Cl | GE Vingmed Ultrasound AS), that had a linear superficial probe.

Pre-injection preparation:

Before injecting, the area was carefully examined for any signs of cranial anomalies or other nearby anatomical abnormalities, such as scars, skin lesions, or test feeling in the GON dermatome. The patients were placed in a sitting posture, with their heads propped up and their necks bent forward.

Technique:

The external occipital protuberance was initially identified by positioning the probe in the transverse orientation at midline. The C2 spinous process was identified by its bifid appearance by moving the transducer in a caudal trajectory over the location of C1. The obliquus capitis inferior (OCI) muscle was identified by moving the transducer in a lateral direction, with the lateral margin of the transducer directed toward the transverse process of C1. This movement was initiated upon the proper identification of C2.

The GON was located to lie just below the OCI and to run laterally and medially through the muscle from the back to the front. Doppler US was used to determine whether vascular structures were present or not before needle implantation. Direct US imaging was used to guide the needle's advancement in a medial to lateral plane using the transducer until its tip was seen in the fascial plane between the orbital cuff and semispinalis capitis.

A 25-G, 2-inch spinal needle was utilized for each injection. A total of 4 ml was injected, with 1 ml containing 2% lidocaine, 2.5 ml containing 0.25 % bupivacaine, and 1 ml of betamethasone. It was possible to see the injectate's distribution as it went through the GON and into the two muscles. After 30 minutes of injection, if the GON dermatome did not respond to mild touch, it was considered an effective GON block. (Figure 1)

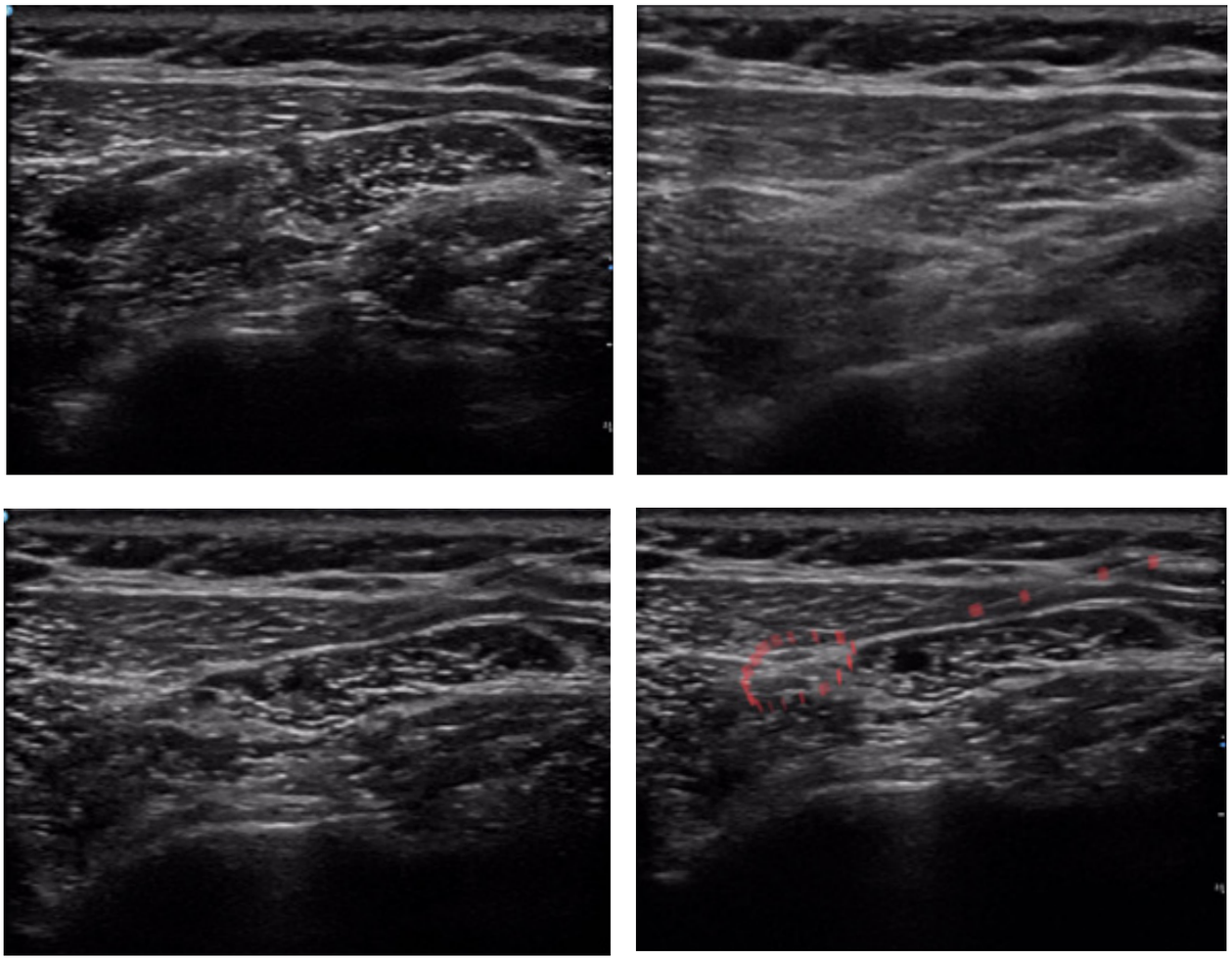

Fig. 1: Ultrasound-guided nerve block.

Every patient was informed about the utilization of a visual analogue scale (VAS) for post-operative pain assessment. No pain is indicated by a VAS value of 0, and the worst pain possible is indicated by a score of 10.[10].

The modified Rankin scale (mRS) is used to grade patients from 0 to 6 in order to anticipate their outcomes. A good functional outcome is often rated between 0 and 2, while a bad functional outcome is scored between 3 and 6[11].

The patients will be asked to score their degree of satisfaction on a 5-point Likert scale, where 1 indicates extremely dissatisfied, 2 indicates dissatisfied, 3 indicates neutral, 4 indicates satisfied, and 5 indicates extremely satisfied[12].

We assessed VAS, mRS, and patient satisfaction were measured at baseline, immediately following the intervention, one week later, and one month later.

The primary outcome was the VAS. The secondary outcomes were mRS and patient satisfaction.

Sample Size Calculation

G*Power 3.1.9.2 (Universitat Kiel, Germany) was employed to calculate the sample size. We conducted a pilot study with five cases in each group and discovered that the average VAS score before the intervention was 7.6 ± 3.78 and 4.2 ± 1.92 one week after the intervention. The following factors were taken into account when determining the sample size: Group ratio of 1:1, effect size of 1.134, 95% confidence limit, 95% power of the study, and six cases were included to overcome dropout. Consequently, we enrolled 50 patients in this study.

Statistical Analysis

SPSS v26 (IBM Inc., Chicago, IL, USA) was employed to conduct statistical analysis. The standard deviation (SD) and mean were used to present quantitative parametric data. The Wilcoxon test was used to compare quantitative non-parametric data, which were presented as median and interquartile range (IQR). Frequency and percentage (%) were employed to represent qualitative variables. Statistical significance was defined as a two-tailed *P value* that was less than 0.05.

RESULTS

The mean value (± SD) of age was 44.6 (±13.8) years. Sex was male in 28 (56%) patients and female in 22 (44%) patients. The mean value (± SD) of weight was 83.5 (±13.17) kg of height was 1.67 (±0.07) m and of BMI was 30.1 (±3.55) kg/m^2. DM was present in 10 (20%) patients, hypertension was present in 15 (30%) patients, smoking was present in 17 (34%) patients. (Tabel 1)

Table 1: Demographic data and comorbidities of the studied patients.

		(*n*=50)
	Age (years)	44.6 ± 13.8
Sex	Male	28 (56%)
	Female	22 (44%)
	Weight (kg)	83.5 ± 13.17
	Height (m)	1.67 ± 0.07
	BMI (kg/m2)	30.1 ± 4.99
	DM	11 (22%)
Comorbidities	Hypertension	14 (28%)
	Smoking	17 (34%)

Data are presented as mean ± SD or frequency (%). BMI: Body mass index, DM: diabetes mellitus.

VAS and mRS measurements were significantly lower immediate post intervention, 1w and 1m than pre intervention (P<0.001). Patient satisfaction score was significantly higher immediate post intervention, 1w and 1m than pre intervention (P<0.001). (Tabel 2)

Table 2: VAS, mRS, and patient satisfaction score of the studied patients.

	Pre intervention	Immediate post intervention	1w	1m
VAS	7 (7-8)	4 (3-5)	3 (2-4)	2 (1-3)
P value		<0.001*	<0.001*	<0.001*
mRS	3 (2-4)	2 (1-2.75)	2 (1-2)	1 (0-2)
P value		<0.001*	<0.001*	<0.001*
Patient satisfaction score	2 (1-2)	2 (2-3)	3 (2-3.75)	3 (3-4.75)
P value		<0.001*	<0.001*	<0.001*

Data are presented as median (IQR). *Significant as *P value≤0.*05. VAS: Visual Analogue Scale, mRS: Modified Rankin scale.

DISCUSSION

Conventional therapies for ON have shown inconsistent success in mitigating symptoms. A promising alternative for managing the intense pain associated with ON is the employment of US-guided nerve blocks[13].

US technology is employed to guide nerve blocks, enabling the precise designation of anatomical landmarks and the neural target. This results in a more precise deposition of local anesthetic and steroid medication around the occipital nerves. This level of accuracy has the ability to lessen the likelihood of problems like vascular puncture and inadequate nerve block that might arise from using blind or landmark-based procedures[14].

Our study showed that VAS and MRS measurements were significantly lower immediate post intervention, 1w and 1m than pre intervention. Patient satisfaction score was significantly higher immediate post intervention, 1w and 1m than pre intervention.

In order to manage refractory cervicogenic headaches, ***Gabrhelík et al.***[15] performed a study to assess the effectiveness of pulsed radiofrequency to the greater occipital nerve block with a combination of local anesthetic and steroids. The results demonstrated a significant 58% reduction in pain three months after therapy and a noteworthy 58% decrease (P < 0.001) at nine months.

Shim et al.[16] discovered that patients suffering from occipital headache experienced a decrease in pain from 6.4 ± 0.2 to 2.3 ± 0.2 at 1 and 4 weeks following US-guided GON block.

Sahin et al.[17] found that patients with primary headache experienced a 66.6% drop in pain score, an 88% decrease in attack period, and no change in attack frequency following the third block of GON block with bupivacaine and dexamethasone.

Concerning cervicogenic headaches, ***Mohamed et al.***[18] found that after 2 weeks of US-guided GON block,

pain scores improved 48% (P = 0.001) and headache frequencies decreased 34%; after 4 weeks of GON block, pain scores improved 42% (P = 0.020), and headache frequencies decreased 31%.

A case report published by Skinner and Kumar[9] demonstrated that the pain score decreased from 9 out of 10 to 2 out of 10 shortly after the US-guided occipital nerve block (ONB) for ON.

According to research by ***Kalra et al.***[5], who evaluate the effectiveness of US-guided ONB in the management of refractory headaches and showed that the pain scores for acute pain were 7.53 before therapy, 1.53 after treatment, and 3.20 after 3 months; for chronic pain, the scores were 8.13 before treatment, 3.07 after treatment, and 5.87 after treatment.

The research encountered certain limitations, including a relatively small sample size. Moreover, the period over which patients were observed was relatively short. As a result, it is advisable for subsequent research to include a more extensive sample size, extend the period of observation, and include comparisons with other techniques to strengthen the results.

CONCLUSIONS

The application of US nerve block holds substantial potential for those affected by ON as it lowers the levels of pain, better outcomes in terms of function as assessed by the mRS, and an elevation in patient satisfaction.

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Nil.

CONFLICT OF INTERESTS

There is no conflicts of interest.

The authors have no financial or proprietary interests in any material discussed in this article.

AUTHORS' CONTRIBUTION

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [MAA], [AZ], [AMI], [HN], [MI] and [ASN]. The first draft of the manuscript was written by [MM] and [AE] and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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إحصار العصب الموجه بالموجات فوق الصوتية في إدارة الألم العصبي القذالي

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الخلفية: الالتهاب العصبي القذالي هو حالة تتميز بالصداع القذالي المزمن، والذي يُعتقد أنه ناتج عن تهيج أو ضغط على العصب القذالي الأكبر وعادة ما يظهر هذا المرض مع ألم حاد وطاعن في الجزء الخلفي من الرأس، ويمكن أن يرتبط بأعراض أخرى مثل حساسية فروة الرأس والألم الذي يمتد إلى الرقبة أو خلف العينين. أصبح استخدام الموجات فوق الصوتية لتوجيه الإبر في الإجراءات التشخيصية والعلاجية مثل حظر الأعصاب أو الحقن أمرًا شائعًا بشكل متزايد في عيادات الألم المزمن.

الهدف: كان الهدف من هذه الدراسة هو تقييم فعالية كتلة العصب القذالي الأكبر الموجهة من الولايات المتحدة في إدارة مرضى الالتهاب العصبي القذالي.

أجريت هذه الدراسة التداخلية على ٥٠ مريضًا تتراوح أعمارهم بين ١٨ إلى ٧٠ عامًا، من كلا الجنسين، والذين كان لديهم الالم العصبي القذالي، المقرر إجراؤهم حظر العصب الموجه بالموجات فوق الصوتية. تم استخدام المقياس التناظري البصري لقياس الألم، ومقياس رانكين المعدل لقياس النتائج، وتم تقييم رضا المرضى.

النتائج: كانت قياسات المقياس التناظري البصري وقياسات مقياس رانكين المعدل أقل بكثير بعد التدخل مباشرة، وبعد اسبوعا وشهرا مقارنةً بالتدخل المسبق. كانت درجة رضا المرضى أعلى بشكل ملحوظ بعد التدخل مباشرة، وبعد اسبوعا وشهرا مقارنة بما قبل التدخل.

النتيجة: يحتمل أن يكون لتطبيق حظر العصب باستخدام الموجات فوق الصوتية إمكانات كبيرة لأولئك المتأثرين بالتهاب العصب القذالي، مما يدل على انخفاض مستويات الألم، وتحسين النتائج الوظيفية كما تم قياسها بمقياس رانكين المعدل، وزيادة رضا المرضى.