e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(12); 294-297

Original Research Article

Anal Acoustic Reflectometry Forecasts the Results of Faecal Incontinence Examination using Percutaneous Nerve Stimulation

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Received: 03-07-2023 Revised: 11-08-2023 / Accepted: 20-09-2023

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Conflict of interest: Nil

Abstract

Background: Some faecal incontinence patients respond favorably to sacral nerve stimulation (SNS). Before a costly implant is placed, a procedure called percutaneous nerve evaluation (PNE) is carried out to determine which individuals are most likely to experience success with SNS. The purpose of this study was to determine whether the results of a pee nephrogram (PNE) for faecal incontinence could be predicted based on anal sphincter function parameters as determined by anal acoustic reflectometry (AAR).

Methods: Women with faecal incontinence undergoing PNE were recurited. AAR was completed on the day of the procedure immediately before PNE, followed by anal manometry. The course of PNE was predicted using the findings from the bowel diary and the incontinence severity score. Logistic regression analysis was used to compare individuals who have successful PNE results to those with poor results in an effort to identify any independent drivers of success.

Results: Eighteen (37%) of the fifty patients that were enrolled had an unsuccessful PNE result, and 31 (61%) had a successful one. Patients who went on to have a successful PNE result had an AAR variable opening pressure that was considerably higher than that of patients who did not. The maximal resting pressure, which is the manometric equivalent, did not change. Opening pressure had an odds ratio of 1.07, making it an independent predictor of success.

Conclusion: Sphincter function can be sensitively assessed by AAR, which can distinguish between individuals who respond to PNE and those that do not. Opening pressure can help choose whether individuals are candidates for this costly treatment option because it is an independent predictor of PNE effectiveness.

Introduction

Bowel control issues are more common as people age, impacting 15% of the population over 50 [1]. For bowel incontinence, sacral nerve stimulation (SNS) has shown to be an effective treatment. But not all patients respond well to it, so before the permanent SNS device is put, they undergo a trial procedure known as percutaneous nerve evaluation (PNE). This makes it easier to decide if SNS is right for them [2].

The success or failure of PNE for bowel incontinence has been studied by doctors, but no clear indicators have been found to far [3]. The effectiveness of the anal sphincter can be measured with the approved method known as anal acoustic reflectometry (AAR). In women with bowel incontinence, it has been demonstrated to be dependable and to correspond with the degree of symptoms. Still, it's not apparent if AAR can assist physicians in selecting the best course of action [4].

The aim of this study was to investigate if AAR data might be utilized to predict PNE for bowel incontinence, as opposed to standard anal manometry.

Methodology

Study Design: Women experiencing dyspepsia who were receiving percutaneous nerve examination

(PNE) at Hi-Tech medical college and hospital, Bhubaneswar were the target population.

Exclusion Criteria: Individuals exhibiting other symptoms such as rectal prolapse, obstructed defecation, or anal pain were not included.

Procedure: The kind of bowel incontinence experienced by each patient was recorded, encompassing urge (inability to delay urination), passive (unconscious soiling), and mixed (a blend of urge and passive forms).

Prior to PNE, they used the Vaizey incontinence score to measure the degree of bowel incontinence and inquired about the patients' typical stool consistency. Additionally, they performed endoanal ultrasonography, or EAUS, to look for anal sphincter abnormalities.

On the day of the procedure, they conducted traditional anal manometry and anal acoustic reflectometry (AAR), right before the temporary PNE electrode was inserted. AAR evaluates anal sphincter function using sound waves. Both at rest and during voluntary contraction, they measured a number of characteristics. After that, they measured the squeeze and resting pressures at several locations along the anal canal using traditional anal manometry.

Following these examinations, the PNE operation was performed on each patient. A temporary electrode was implanted, and the test was run for two weeks. Patients maintained a bowel journal and could change the stimulation levels during this period. A substantial decrease in incontinence episodes or the Vaizey incontinence score was indicative of a successful PNE test.

Statistical Analysis: To identify determinants of a successful PNE result, they performed multivariable logistic regression analysis and statistical analysis of the data using tests such as the $\chi 2$ test and Mann-Whitney U test. Sensitivity and specificity were evaluated using receiver operating characteristic (ROC) curves. They analyzed the data using SPSS software, classifying results as statistically significant if $p < 0.050$.

Result

In order to assess percutaneous nerve evaluation (PNE) for faecal incontinence, fifty women took part in the study. Preoperative endoanal ultrasonography (EAUS) was absent in five of them. Eight patients (37%) did not respond well to PNE, whereas 31 patients (61%) had a satisfactory outcome and were qualified for a permanent SNS device following a 2-week PNE test period.

Table 1: Pretreatment characteristics of both unsuccessful and successful groups undergoing percutaneous nerve assessment

	Successful PNE (n=31)	Unsuccessful PNE (n=18)
Age (years)	35–75	31–82
Parity	0-5	0-4
Vaizey incontinence score	10-22	10-23
Bristol Stool Scale score	2-6	1-6
Type of incontinence		
Urge	10	2
Passive	2	2
Mixed	18	13
Previous anorectal surgery	7	2
Anterior sphincter repair	2	1
Postanal repair	2	0
Anal stretch	1	0
Posterior colporrhaphy	1	0
Lateral sphincterotomy	1	0
Mucosal excision	1	1
Previous gynaecological surgery	20	7
Hysterectomy	16	6
Anterior repair	2	1
Posterior repair	1	2
Transvaginal tape	1	1
History of obstetric perineal injury	23	12

The study examined the characteristics of the successful and unsuccessful PNE groups in terms of demographics, Vaizey incontinence ratings, and the existence of sphincter abnormalities on EAUS. There were no discernible variations detected for these parameters.

Additionally, the data from the anal manometry and anal acoustic reflectometry (AAR) in both groups prior to PNE were compared. Although there were

no significant differences in other parameters, patients who had a favorable PNE result had an opening pressure that was considerably higher.

A logistic regression analysis was conducted in order to determine the factors that predicted PNE success. It was discovered that the only independent predictor of success was opening pressure. An opening pressure of 17.4 cmH_2O or greater reliably predicted PNE success, according to a receiver operating characteristic (ROC) curve (sensitivity of 0.80 and specificity of 0.50).

In this sample, the opening pressure was over 17.4 cmH_2O in 24 out of 31 patients who underwent successful PNE, and below this threshold in 11 out of 18 patients who underwent unsuccessful PNE.

Discussion

The purpose of this study was to compare PNE groups that were successful and failed in order to see if preoperative characteristics could predict PNE outcomes. In contrast to earlier research, the preoperative factors of the patients were not known to the person assessing PNE success. The study discovered no statistically significant variations in baseline factors or demographics between the PNE groups that were effective and unsuccessful.

For some cases of faecal incontinence, sacral nerve stimulation (SNS) is a safe and efficient therapy option. Currently, the outcome of a percutaneous nerve evaluation (PNE) trial period is used to determine who should receive a permanent SNS device [5]. However, determining the success of PNEs might be subjective, which makes it difficult to objectively analyze the results of treatment.

In order to better select patients and shorten treatment times, researchers have tried to determine the variables that predict PNE effectiveness [2, 5, 6]. They discovered that a number of variables, including prior operations, incontinence type, and demographics, did not consistently indicate the success of PNEs.

Patients with successful and failed PNE outcomes did not exhibit significantly different results on anal manometry, a common test for anal sphincter function. On the other hand, patients who had a successful PNE had higher opening pressure, indicating better closure of the anal canal, according to anal acoustic reflectometry (AAR), a sensitive test for sphincter function [7, 8].

Standard testing for anal sphincter function, anal manometry, revealed no statistically significant differences between the groups. However, patients with successful PNE exhibited higher opening pressure, indicating a more strong anal sphincter complex, according to anal acoustic reflectometry (AAR), a sensitive way to determine anal sphincter function. Even while it was not statistically significant, the successful PNE group also had increased closure pressure, which may indicate that they were able to produce stronger anal closing forces.

The independent prediction of PNE success by opening pressure was validated using a multivariable logistic regression model. A ROC curve demonstrated that a successful outcome was predicted with strong sensitivity and specificity when the opening pressure was 18.4 cmH_2O or above.

According to these results, assessing anal sphincter function with AAR may be able to predict PNE success, which could help with more effective patient selection for SNS treatment. PNE outcomes are currently determined by subjective measures, including bowel diaries, which can be impacted by a number of circumstances. AAR's prognostic usefulness for long-term outcomes has to be investigated further. Success in PNE does not always equate to success with permanent SNS.

Conclusion

The evaluation of sphincter function can be effectively assessed through AAR, a diagnostic technique capable of discerning between individuals who exhibit a response to PNE and those who do not. The assessment of opening pressure plays a crucial role in determining the suitability of individuals for this expensive therapeutic intervention, as it serves as an autonomous prognostic indicator of the efficacy of PNE.

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