The role of Pudendal Nerve Terminal Motor Latency (PNTML) in the assessment of the external anal sphincter function

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Abstract

Objectives: The objective of our study was to analyse the impact of pudendal nerve terminal motor latency (PNTML) testing on the final treatment procedure in a group of patients who presented to us with anorectal disorders.

Methods: The PNTML results and the final treatment procedure of 24 patients who attended the gastrointestinal physiology laboratory in the Department of Surgery at the University of Colombo was analysed.

Results: Male to female ratio was 6 : 18 (1 : 3). The study population had a median age of 28 years with a range of 13 years to 69 years. The indications for the study were recurrent fistula-in-ano 8 (33%), anal sphincter trauma 6 (25%), rectal prolapse 5 (21%), idiopathic incontinence 3 (13%) and miscellaneous 2 (8%). Twelve patients (50%) indicated bilateral or unilateral abnormality. Only in 4 (17%) patients, the final treatment modality was changed as a result of PNTML report.

Conclusion: Although a significant number of patients (50%) indicated an abnormality in their PNTML values, it was of limited value in deciding the final treatment modality.

Introduction

External anal sphincter (EAS) weakness leading to anal incontinence can occur either due to anatomical separation of the EAS muscles or pudendal nerve injury. Therefore, it is important to differentiate the two conditions in the management of anal sphincter dysfunction, as any repair of a denervated anal sphincter is bound to give poor results in the long-term [1].

Kiff and Swash in 1984 described a technique to measure the pudendal nerve terminal motor latency (PNTML) and demonstrated that some patients with idiopathic faecal incontinence had a neuropathy affecting the terminal portion of the pudendal nerve [2]. Their technique was based on electro ejaculation procedure developed by Brindley for people with spinal cord injuries and this same technique was modified to invent the present manoeuvre that is used to assess the PNTML [3]. However, at present there is a debate regarding the validity of PNTML in the management of anal sphincter dysfunction. Some studies have indicated that PNTML helps but others have indicated PNTML was not predictive of final outcome of surgery [2,4,5,6].

Therefore, the aim of our study was to analyse the impact of PNTML testing on the final treatment procedure in a group of patients who presented to us with anorectal disorders.

Material and method

The analysis was done on patients who underwent testing of PNTML as a part of their routine ano-rectal physiology assessment. There was no special preparation except requesting the patient to empty the rectum prior to the test. Informed verbal consent was taken and the patient was positioned in the left lateral position. A St. Marks disposable pudendal nerve stimulator mounted on the index finger was used for the procedure. Ischial spine was identified by digital rectal examination and the nerve was stimulated (Figure 1) with the stimulating electrode at the tip of the index finger. Initial voltage given for pudendal nerve stimulation was 10 mV and was increased by 5 mV increments till proper voltage curves with depolarization of the nerve was shown on the computer. Three to five values were elicited on

each side depending on the quality of the voltage curve and a mean value was calculated. Medtronic key point software package was used to obtain the voltage curve and to calculate the latency value on each side (Figure 2).

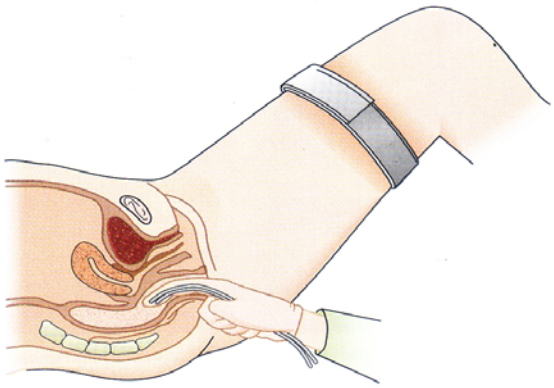

Figure 1

Stimulating the pudendal nerve at the level of ischial spine (note the nerve stimulator mounted on the finger)

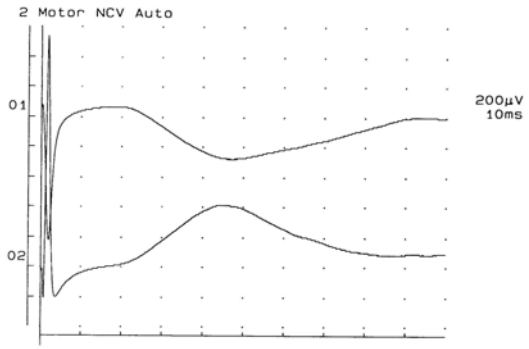

Figure 2

The voltage curve seen on screen

Results

A total of 24 patients underwent PNTML testing over a period of 16 months. Male to female ratio was 6 : 18 (1 : 3). The study population had a median age of 28 years with a range of 13 years to 69 years. The indications for the study (Table 1) were recurrent fistula-in-ano 8 (33%), anal sphincter trauma 6 (25%), rectal prolapse 5 (21%), idiopathic incontinence 3 (13%) and miscellaneous 2 (8%). The results obtained were categorized as normal latency values on both-sides, prolonged latency value on both sides and prolonged latency value on one side with a normal value on the other.

Table 1 – Indications for PNTML testing

Condition	Number	Percentage
Recurrent fistula in ano	8	33%
Anal sphincter trauma	6	25%
Complete rectal prolapse	5	21%
Idiopathic faecal incontinence	3	13%
Other/Miscellaneous	2	8%
Total	**24**	**100%**

Table 2 – PNTML result in each category

Condition	Normal on both sides	Prolonged on both sides	Prolonged on one side
Recurrent fistula in ano	5	-	3
Anal sphincter trauma	3	2	1
Complete rectal prolapse	2	1	2
Idiopathic faecal incontinence	-	1	2
Other / miscellaneous*	1	-	-
Total	**11 (46%)**	**4 (17%)**	**8 (33%)**

**In One patient PNTML could not be elicitde*

The analysis of results (Table 2) indicated that, of the 8 patients with recurrent fistula-in-ano, 5 had normal latency values on both sides and 3 had prolonged latency on one side with the other side having a normal value. 6 patients with anal sphincter trauma, 3 indicated normal latency values on both sides, 2 indicated prolonged latency on both sides and one patient had prolonged latency value on one side with normal latency on the other side. Two patients with complete rectal prolapse indicated normal PNTML values and one indicated prolonged values on both sides. The other two had prolonged values on one side only. One of the three patients with idiopathic faecal incontinence had prolonged latency values on both sides. The other two had prolonged latency values on one side with normal values on the other side. One of the two patients in the miscellaneous group was a patient with anal incontinence who had undergone a pull-through surgical procedure for imperforate anus during infancy. In this patient the PNTML could not be elicited. In addition, in this patient, EAUS also indicated a malformed EAS. The other patient in this group had undergone previous surgery involving the anal sphincter complex (and was due to undergo elective haemorrhoidectomy) and showed bilateral normal PNTML values.

Discussion

The EAS is derived from the posterior part of the cloacal sphincter and has generated considerable debate regarding its structural arrangement. Regardless of how the external anal sphincter is subdivided by numerous anatomists and clinicians, on electromyography, it appears that the striated muscles of the anorectal sphincter complex are acting as one unit [7]. Motor fibres to the EAS pass in the pudendal nerve (S2 and S3) and if present, in the perineal branch of S4. Pudendal nerve passes through the greater and then the lesser sciatic notch to enter the pudendal canal. The inferior rectal branch of the pudendal nerve innervates the external anal sphincter. Unilateral nerve injury may allow near normal function of the anal sphincter if the contra lateral nerve is unaffected [8]. It is also thought that repeated straining leads to stretching of the pudendal nerve and irreversible damage [9,10].

The PNTML is a measurement of the conduction in the fastest conducting nerve fibres. Since the fastest latency is not influenced by the presence of increased numbers of slowly conducting damaged axons, the PNTML does not give a quantitative estimation of the extent of abnormality in the nerve. Therefore, normal pudendal latency does not rule out abnormal innervation [10]. In this context the clinical usefulness of this test is still controversial and for this reason the guidelines given by the American Society of Gastroenterology do not recommend PNTML for evaluation of patients with anal incontinence [11].

We failed to elicit PNTML in the patient who presented with anal incontinence following pull-through surgery during infancy for imperforate anus. This may be due to the fact that during foetal development, absence/malformation of the EAS muscle may also be associated with maldevelopment of the corresponding neurovascular bundle. Therefore, he was counselled regarding the inability to repair the sphincters except attempting a gracilis neosphincter procedure.

Regardless of the findings of PNTML, the patients who demonstrated loss of anatomical sphincter integrity on endoanal ultrasound scan (EAUS) underwent surgery for sphincter reconstruction. In addition, all the patients with recurrent fistula-in-ano also underwent surgery irrespective of their PNTML results. The others were managed conservatively with low roughage diet and pelvic floor exercises. In addition, irrespective of PNTML study results all the patients with rectal prolapse also underwent corrective surgery as failure to do so would have lead to further damage to the pudendal nerves (due to stretching) and the anal sphincter mechanism. Those with idiopathic incontinence with poor PNTML were managed conservatively as surgery on a poorly innervated sphincter muscle is bound to give poor results [1].

If the overall impact of PNTML is considered, in our series, the result of PNTML changed the management in only 4 (17%) patients (3 patients with idiopathic faecal incontinence and 1 with pull through surgery for imperforate anus) and the majority (n = 20, 83%) underwent surgery irrespective of their PNTML results. However on analysis of overall results, 50% (n = 12) had

prolonged pudendal nerve latency on one or both sides. All these patients were counselled regarding the possibility of them developing anal incontinence following surgery.

Conclusion

In keeping with the guidelines given by the American Society of Gastroenterology, our study also indicated only a limited role for PNTML testing in the management of anal sphincter dysfunction [11]. However, although the PNTML is of limited value in planning the final treatment, it gives the clinician an opportunity for preoperative counselling to prevent the patients from having any unrealistic expectations of the outcome of treatment.

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