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Transcutaneous Tibial Nerve Stimulation on Incontinence Among Rectal Cancer: A Case Series

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ABSTRACT

Recent times surgeries associated with cancer and its complications are challenging, Globally. Low Anterior Resection Syndrome is a collection of symptoms or issues the Subjects have after removing a part of or entire rectum. Transcutaneous Tibial nerve stimulation (TTNS) is a form of neuromodulation involving the use of electrical impulses to address urinary symptoms. Overactive Bladder (OAB) is nothing but a frequent & a sudden urge to urinate that may be difficult to control (urgency incontinence). ICIQ-SF [International Consultation on Incontinence Questionnaire-Short Form] is used widely in urinary incontinence with neurological condition & used to assess type of incontinence & quality of life. Low Anterior Resection Syndrome is an easy-to-use tool for assessment of bowel dysfunction following a Low Anterior Resection for Rectal Cancer. This case series was conducted to analyze the impact of TTNS in 4 male individuals aged between 42 to 69 Outcome measures were assessed before and after the application of treatment (6days/week for 3 weeks)

Keywords: *Low Anterior Resection Syndrome, Overactive Bladder, Quality of life, Total mesorectal excision..*

1. INTRODUCTION

In recent days, between 25% & 80% of Subjects undergoing a low or very low anterior resection will suffer fecal urgency, frequent bowel movements &incontinence[1]. Low anterior resection syndrome (LARS) is a collection of symptoms that people who have undergone a partial or total resection of the rectum might have [2,3].Overactive bladder (OAB) is a common condition which refers to urgency with or without urgency incontinence, usually with frequency and nocturia in the absence of an underlying metabolic or pathological condition [4]. In 2001-2003, about 186 males & 130 females were recorded for rectal cancer in Chennai. Rectal cancer is the second most common cancer in large intestine.Neuromodulation approaches including tibial nerve stimulation (TNS) may be valuable noninvasive therapeutic alternative, transcutaneous TNS (TTNS) using patch electrodes instead of a needle electrode facilitates the acceptability as well as handling of the device, and patients can also use it at home [5].The amplitude was set to produce a sensory stimulus in the ipsilateral foot, at an intensity tolerable to the Subject. Stimulation is given for 30 min. The rectal tumours may be present with special manifestations different from other cancers within Gastro-Intestinal Tract. It is a non-pharmacalogical method of inhibiting the presynaptic afferent neurons carrying impulses from bladder by stimulating the nerves of peripheral segmental dermatome. Posterior Tibial Nerve is a mixed nerve containing L5-S3 fibres, originating from the same spinal segments as the parasympathetic innervations to bladder (S2-S4).TTNS stimulate tibial nerve & sends impulse to sacral plexus, group of nerves at the base of spine responsible for bladder function, by stimulating this, bladder activity can be changed thereby incontinence will reduce [6]. TENS is based on gate control theory of abolishing the local micturition reflex arc [7]. Further investigation of this system's efficacy in the field of OAB is warranted to compare to other published treatment modalities and controls [8]. Therefore this case series focuses on the significance of TTNS on OAB among LARS in Rectal cancer Subjects

CASE 1

A 69 years old Male Subject was found with complaints of urinary & bowel incontinence after 5 years of his TME rectal surgery (Total Mesorectal Excision). The Subject has his past medical history of Diabetes Mellitus (type I) for the past 11 years (i.e) from 2011. At present he was tested with the present co-morbidities like [Blood sugar level 233 mg/dL& Hypertension 139/84 mm Hg]. This subject was included into the study followed by fulfilling the selection criteria - Low

anterior resection syndrome score [LARS] [9] is 26 and the lower limb sensation over the treatment area is intact. The pre test values of International consultation on Incontinence Questionnaire [ICIQ] is 10, Quality of life is 21. The benefit of the case series& treatment intervention was explained to the subjects and a written informed consent was taken

Initially, the Subject is treated via Transcutaneous Tibial Nerve Stimulation [TTNS]. The Subject was made to lie on the bed in supine position. The pad electrodes of TENS machine were placed over posterior & superior to the medial malleolus and the other pad is placed apex 10cm cephalad to this continuous stimulation at a pulse width of 200 lb at a frequency of 10HZ is used **[Tabel/Figure 3].** The intensity was adjusted based on the individual's sustainability towards the impulse applied. Stimulation was given for 30 minutes. The first week treatment results aren't given a noticeable improvement but the post test values such as ICIQ – 6, LARS – 18 and QOL – 15 obtained after 3 weeks shows a good improvement. (refer Table/Fig: 4 for post intervention progressions).

CASE 2

A 43 years old Male Subject was found with complaints of urinary & bowel incontinence after 4 years of his Total Mesorectal Excision [TME] . The Subject has no medical history of Diabetes Mellitus & Hypertension. The Subject leaks urine once in a while when he coughs or sneezes, bends down or lift &when he walks quick or jogs or performs any vigorous exercise, leaks urine often when he undresses to use the toilet &reaching before the toilet, has the urge to urinate, so he has a habit of rushing to the bathroom. This subject was included into the study followed by fulfilling the selection criteria - Low anterior resection syndrome score is 21 and the lower limb sensation over the treatment area is intact. Subject leaks urine rarely when he coughs or sneeze, does not leak urine when he bends down or lift, leaks urine once in a while when he walks quick or jogs or performs any vigorous exercise, leaks urine often when he undresses to use the toilet, leaks urine most of the time when reaching before the toilet &has the urge to urinate, so he has a habit of rushing to the bathroom. The pre test values of International consultation on Incontinence Questionnaire [ICIQ] is 12, Quality of life is 20. The benefit of the study & treatment intervention was explained to the subjects and a written informed consent was taken

Initially, the Subject was treated via Transcutaneous Tibial Nerve Stimulation [TTNS]. The Subject was made to lie on the bed in supine position. The pad electrodes of TENS machine were placed over posterior & superior to the medial malleolus and the other pad is placed apex 10cm cephalad to this continuous stimulation at a pulse width of 200 lb at a frequency of 10HZ is used **[Tabel/Figure 3].** The intensity was adjusted based on the individual's sustainability towards the impulse applied. Stimulation was given for 30 minutes. The first week treatment result shows no significant improvement but the post test values such as ICIQ – 7, LARS – 14 and QOL – 16 obtained after 3 weeks shows a good improvement. (refer Table/Fig: 4 for post intervention progressions).

[Table/Fig:4] ComparativedescriptivefindingsoffourcaseswithUrinary&Bowel incontinence using the outcomes measure ICIQ-SF, LARS Score, I-QOL

CASE	TYPE OF SURGERY	CO- MORBIDITIES	OUTCOME TOOLS & ITS SCORES		
			ICIQ Score	LARS Score	I-QOL Score
Case1 69 years old male with urinary & bowel incontinence.	Total Mesorectal Excision (TME) on March 9, 2019	K/C/O – Type 1 Diabetes from 2011, BP: 149/85 mm Hg	Moderate	Mild	Moderate
Case 2 43 years old	Total	N/K/C/O- Diabetes	Mild	Moderate	Moderate

Male with urinary & bowel incontinence.	**Mesorectal Excision (TME) on March 11, 2020**	**Mellitus, Hypertension**			
Case 3 42 years old Male with urinary & bowel incontinence	**Rectal surgery on May 5, 2021**	**N/K/C/O- Diabetes Mellitus, Hypertension**	**Moderate**	**Moderate**	**Moderate**
Case 4 53 years old Male with urinary & bowel incontinence	**Rectal surgery on December 23, 2021**	**K/C/O- Hypertension: 190/100 mm Hg, N/K/C/O- Diabetes Mellitus,**	**Moderate**	**Moderate**	**Moderate**

CASE 3

A 42 years old Male Subject f, was found with complaints of urinary & bowel incontinence after 3 years ofhis rectal surgery. The Subject has no medical history of Diabetes Mellitus &Hypertension. The Subject was present with urinary incontinence while performing ADL activities, due to removal of rectum.It has been observed that this subject was included into the study followed by fulfilling the selection criteria - Low anterior resection syndrome score is 21 and the lower limb sensation over the treatment area is intact. Subject leaks urine rarely when he coughs or sneeze, does not leak urine when he bends down or lift, leaks urine once in a while when he walks quick or jogs or performs any vigorous exercise, leaks urine often when he undresses to use the toilet, leaks urine most of the time when reaching before the toilet &has the urge to urinate, so he has a habit of rushing to the bathroom. The pre test values of International consultation on Incontinence Questionnaire [ICIQ] is 11, Quality of life is 21. The benefit of the study & treatment intervention was explained to the subjects and a written informed consent was taken

Initially, the Subject is treated via Transcutaneous Tibial Nerve Stimulation [TTNS]. The Subject was made to lie on the bed in supine position. The pad electrodes of TENS machine were placed over posterior & superior t o the medial malleolus and the other pad is placed apex 10cm cephalad to this continuous stimulation at a pulse width of 200 lb at a frequency of 10HZ is used **[Tabel/Figure 3].** The intensity was adjusted based on the individual's sustainability towards the impulse applied. Stimulation was given for 30 minutes. The first week treatment results aren't given a noticeable improvement but the post test values such as ICIQ – 7, LARS – 17 and QOL – 15 obtained after 3 weeks shows a good improvement. (refer Table/Fig: 4 for post intervention progressions).

CASE 4

A 53 years old Male Subject was found with complaints of urinary & bowel incontinence after 3 years ofhis rectal surgery. The Subject has the history of hypertension for the past 4 years & no medical history of Diabetes Mellitus. The Subject was present with urinary incontinence for the past 5 months after rectum surgery. The Subject leaks urine once in a while when he coughs or sneezes, bends down or lift, leaks urine often when he walks quick or jogs or performs any vigorous exercise & leaks urine rarely when he undresses & reaching before the toilet. This subject was included into the study followed by fulfilling the selection criteria - Low anterior resection syndrome score is 18 and the lower limb sensation over the treatment area is intact. Subject leaks urine rarely when he coughs or sneeze, does not leak urine when he bends down or lift, leaks urine once in a while when he walks quick or jogs or performs any vigorous exercise, leaks urine often when he undresses

to use the toilet, leaks urine most of the time when reaching before the toilet &has the urge to urinate, so he has a habit of rushing to the bathroom. The pre-test values of International consultation on Incontinence Questionnaire [ICIQ] is 13, Quality of life is 21. The benefit of the study & treatment intervention was explained to the subjects and a written informed consent was taken

Initially, the Subject is treated via Transcutaneous Tibial Nerve Stimulation [TTNS]. The Subject was made to lie on the bed in supine position. The pad electrodes of TENS machine were placed over posterior & superior to the medial malleolus and the other pad is placed apex 10cm cephalad to this continuous stimulation at a pulse width of 200 lb at a frequency of 10HZ is used **[Tabel/Figure 3].** The intensity was adjusted based on the individual's sustainability towards the impulse applied. Stimulation was given for 30 minutes. The first week treatment results aren't given a noticeable improvement but the post test values such as ICIQ – 9, LARS – 14 and QOL – 17 obtained after 3 weeks shows a good improvement. (refer Table/Fig: 4 for post intervention progressions).

2. DISCUSSION

This present Case Series has been conducted to find out the impact of Transcutaneous Tibial nerve Stimulation [TTNS] on Over Active Bladder (OAB) among Low Anterior Resection Syndrome [LARS] in rectal cancer Subjects. The subjects were selected based on selection criteria such as intact sensation of treatment area, LARS score between 20 to 42, bowel and bladder incontinence followed by rectal cancer surgery. Pre and post values were assessed before and after 3 weeks of treatment administration. Outcome tools such as "International Consultation on Incontinence Questionnaire - (ICIQ-SF) for urinary incontinence, lower anterior resection syndrome (LARS) score sheet for bowel incontinence & I-QOL incontinence quality of life for bladder. The summarized form of clinical findings were tabulated **[**

/Figure 4]. Interpretation based on the outcome measures of each cases are discussed as follows: Case 1 shows marginal improvement in LARS with value of 18/50 & no (or) minimal improvement in post-test value of ICIQ-SF [6/21] & I-QOL [15/32].Case 2 shows significant improvement in LARS with value of 14/50 & no (or) minimal improvement in post-test value of ICIQ-SF [7/21] & I-QOL [16/32].Case 3 shows marginal improvement in ICIQ-SF [7/21] & no (or) minimal improvement in post-test value of LARS [17/50] & I-QOL [15/32].Case 4 shows marginal improvement in ICIQ-SF [9/21] & no (or) minimal improvement in post-test value of LARS [14/50] & I-QOL [17/32]. Summary of the pretest and posttest values of each cases were presented in the **table/figure 5.**

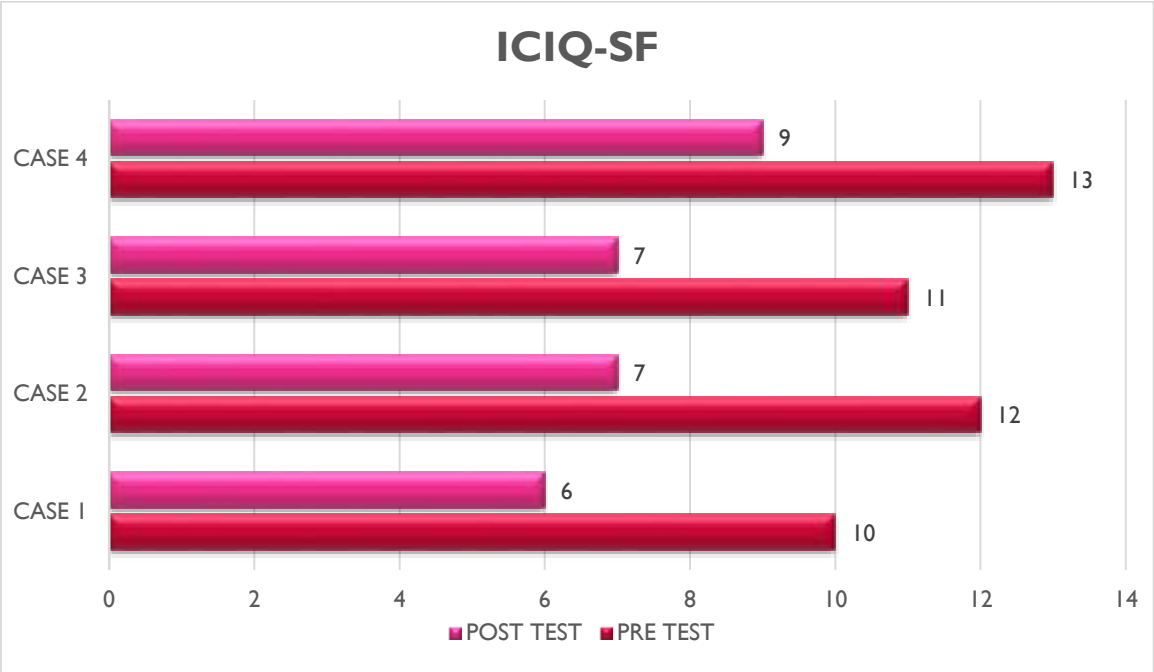
[Table/Fig:5] Distribution of Pre and Post test values of each cases for ICIQ-SF, LARS Score, I-QOL

S.NO	ICIQ-SF		LARS SCORE		I-QOL	
	PRE TEST	POST TEST 3RD WEEK	PRE TEST	POST TEST 3RD WEEK	PRE	POST TEST 3RD WEEK
Case 1	10	6	26	18	21	15
Case 2	12	7	21	14	20	16
Case 3	11	7	21	17	21	15
Case 4	13	9	18	14	21	17

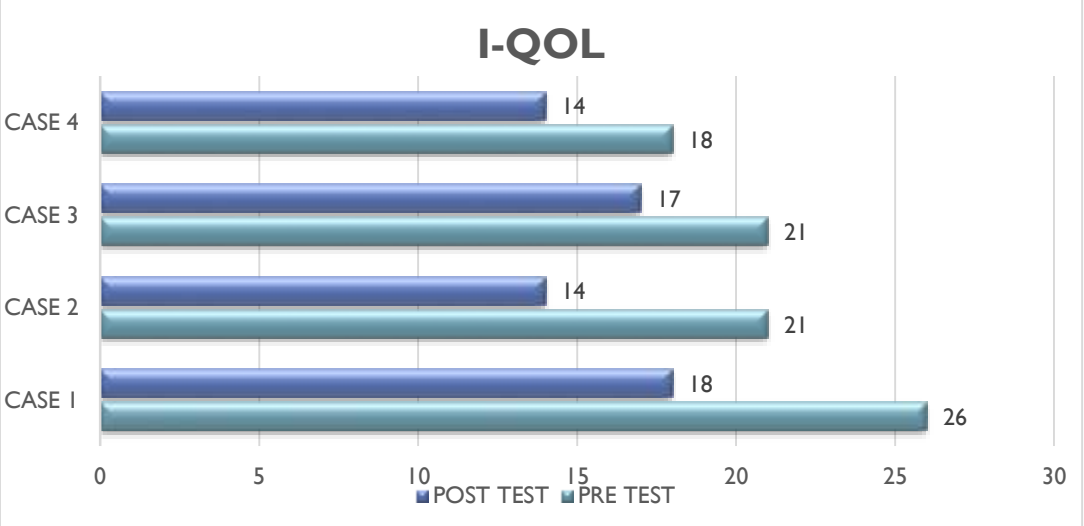
Based upon the obtained values

/figure 6,7&8, there presents a positive improvement in the outcome measures. Furthermore, the posterior tibial nerve is a mixed nerve containing L5-S3 fibres, originating from the same spinal segments as the parasympathetic innervations to the bladder (S2-S4). Neurophysiological process & neural circuits involved in controlling the lower urinary tract. Stimulation of peripheral nerves & subsequent cross talk at the level of postganglionic neuro-effector junction can modulate transmission. This implies that stimulating one area of innervation system seems to alter the nerve behavior of the other, leading to bladder inhibition by stimulating peripheral nerves [10,11,12]. There are some studies which provides a solid evidence states that stimulation of posterior tibial nerve can improve fecal incontinence and the associated symptoms of low anterior resection syndrome could be reduced resulting in the good control of bladder and bowel incontinence [13,14,15,16].

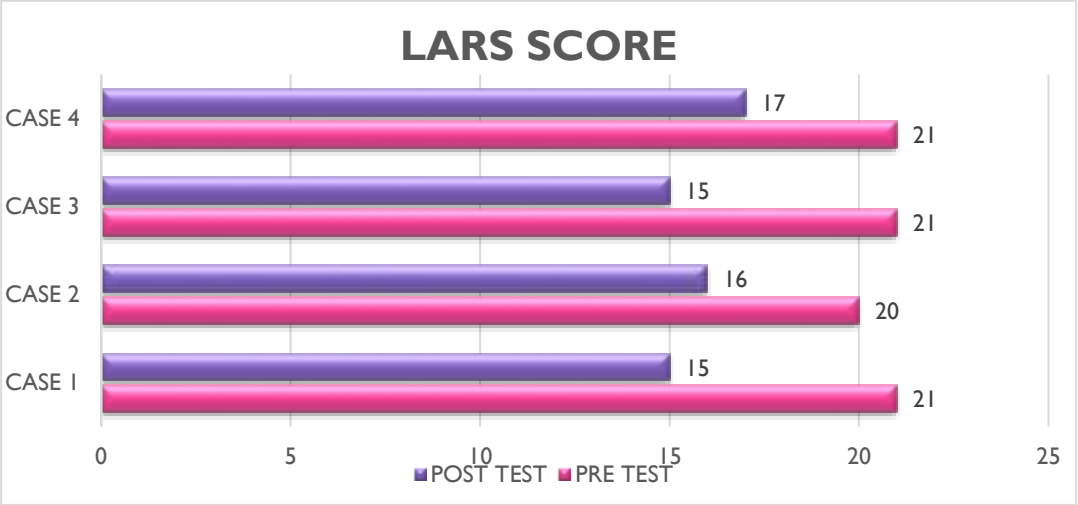
[Table/Fig:6]Graphical presentation of pre test and post test values of ICIQ-SF shows the significant improvement



[Table/Fig:7]Graphical presentation of pre test and post test values of ICIQ-SF shows the significant improvement



[Table/Fig:8]Graphical presentation of pre test and post test values of I-QOL shows the significant improvement



3. CONCLUSION

As per the scores of ICIQ-SF, LARS, I-QOL obtained from each cases (rectal cancer subjects), it is evident that there is an improvement in the symptoms followed by the 3 weeks of treatment. Therefore, this study concludes that TTNS is effective in improving Urinary incontinence, Bowel incontinence resulting to the improvement of Incontinence - Quality of life among Rectal cancer Subjects

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