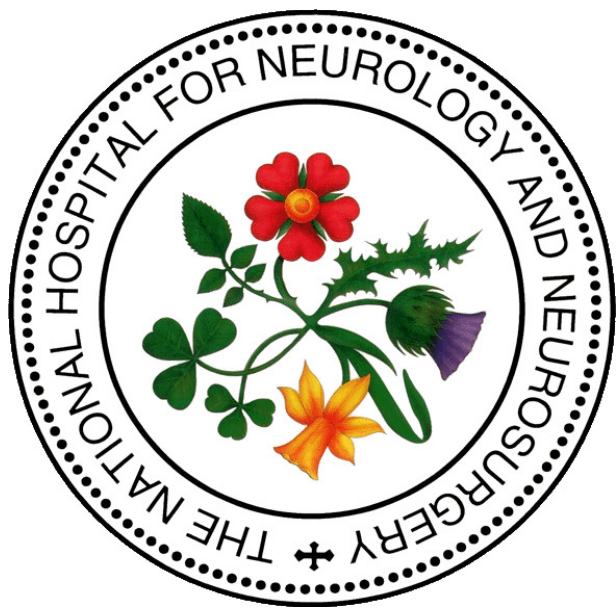




# Audit results of transcutaneous tibial nerve stimulation (TTNS) therapy in adult patients with overactive bladder (OAB) symptoms

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## Hypothesis / aims of study

Percutaneous tibial nerve stimulation (PTNS) is an established therapy for refractory OAB. However, TTNS is emerging as an alternative to the PTNS due to its cost-effectiveness and ease of implementation. This study aims to observe the practical difficulties in implementing the TTNS over a long period.

## Study design, materials and methods

A single clinical scientist-led TTNS clinic was set up in an Uro-neurology department that runs parallel to the PTNS clinic. Patients were given the choice to choose either PTNS or TTNS therapy as part of their treatment for OAB. However, they are restricted from mixing both therapies at the same time. Patients selected for the TTNS underwent a routine nerve conduction study to assess their tibial nerve function. The tibial nerve stimulation frequency was fixed to 10 Hz, but the intensity and duration of pulses were customised to individual patients depending on their responses in the sole of their foot. Duration and the intensity of the pulses were adjusted to get a good buzzing sensation in the entire sole of their foot. Once satisfactory stimulation parameters were achieved, the TTNS machine was locked to preserve the stimulating parameters from accidental changes to settings. Patients were educated on using the machine and encouraged to take images or videos while connecting the electrodes. Patients were also encouraged to try to use the TTNS in the clinic several times until they were comfortable using it. Patients were told to use the TTNS every day for 20 minutes at any time. A 3-month follow-up appointment was given to determine the effectiveness of the TTNS on their OAB symptoms. Each patient was given a TTNS machine and eight reusable stimulating pads that could last more than three months with no obligation to return the kit to the department. A repeat 3-month follow-up appointment was made for patients who did not attend the clinic or did not use the TTNS machine properly. In the follow-up clinic, patients were encouraged to give feedback on the TTNS's usefulness. Additional training was given to those not using the machine correctly, and consumables were restocked to those who wished to continue the TTNS.

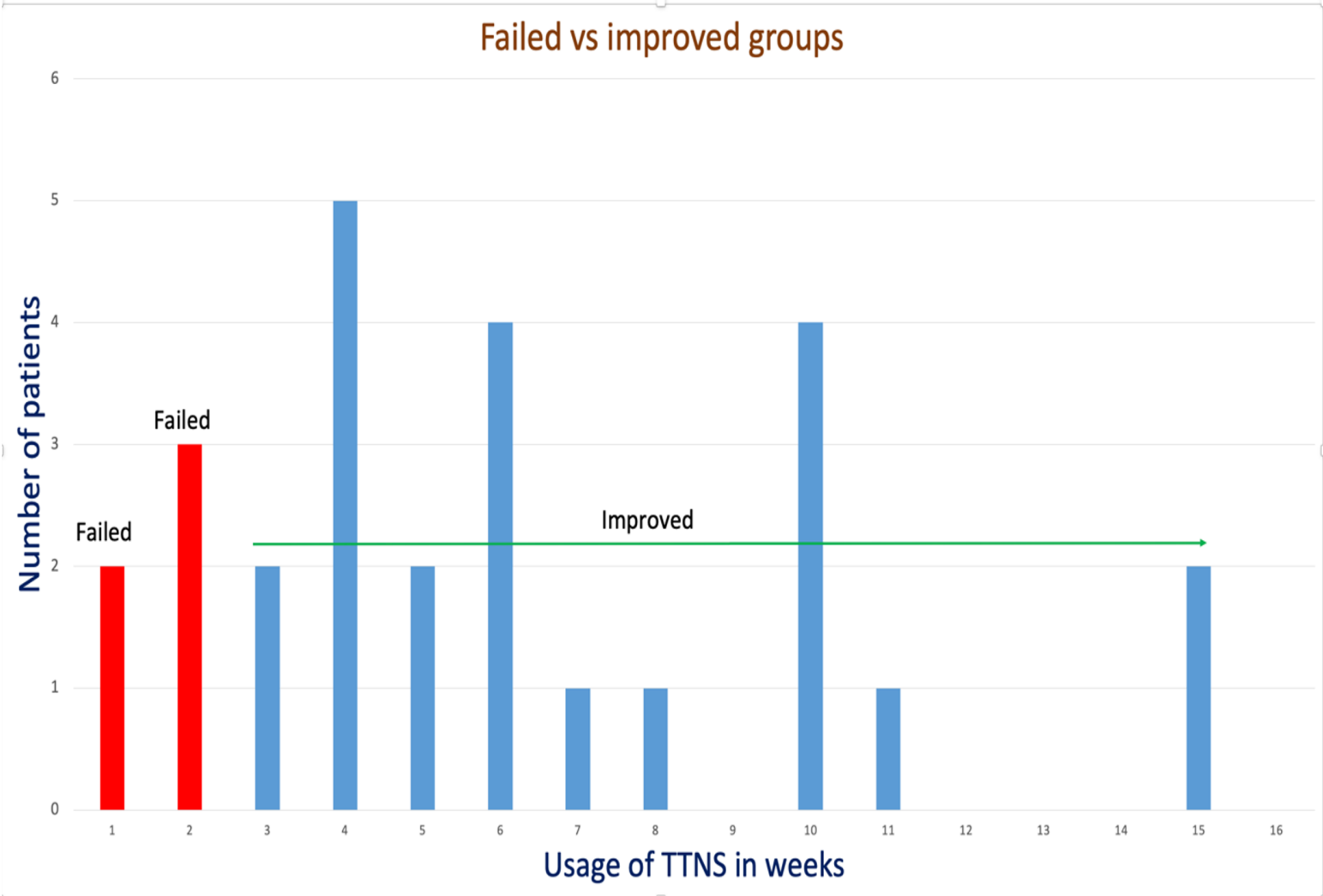
|                                |                 | Total TTNS usage in the failed group |           |           |           |          |
|--------------------------------|-----------------|--------------------------------------|-----------|-----------|-----------|----------|
| Referral diagnosis             | No. of patients | Case 1                               | Case 2    | Case 3    | Case 4    | Case 5   |
| Parkinson's disease            | 5               | <2 weeks                             | <2 weeks  | <6 months | <3 months | <2 weeks |
| Tarlov cyst                    | 1               | <2 months                            |           |           |           |          |
| Idiopathic transverse myelitis | 1               | <6 months                            |           |           |           |          |
| Small fibre neuropathy         | 1               | <6 months                            |           |           |           |          |
| Friedreich's ataxia            | 4               | <6 months                            | <6 months | <1 month  | <6 months |          |
| MS                             | 2               | <2 weeks                             | <2 weeks  |           |           |          |
| Total failed cases             | 14              |                                      |           |           |           |          |

## Results

Over 17 months, 101 new patients (70 females, 31 males) utilised the TTNS service, with a mean age of 55.9 (21-81) years. 33 (32.7%) patients found it helpful with the TTNS, and 14 (13.9%) found no use. Ten (9.9%) patients were not interested in using the TTNS and returned the machine to the department but declined to give any reason. 44 (43.6%) did not attend two follow-up appointments or know the outcome.

## Interpretation

Fourteen patients who did not respond to the TTNS were analysed to understand the underlying reasons. The distribution of TTNS usage and their medical history are shown in Table 1. Four patients with Friedreich's ataxia who used the TTNS machine between 1 and 6 months reported no use with it. There were no patients with Friedreich's ataxia in the success group. The tibial nerve motor conduction study was normal in this group, but several sensory responses were absent. The patient with a Tarlov cyst did not respond to the TTNS even after two months of usage. The patient's S2 and S3 dermatomal evoked potential (dSEP) studies and the pudendal somatosensory evoked potential study were abnormal. Five patients with multiple sclerosis and Parkinson's disease did not use the TTNS for more than two weeks. The patient with a confirmed small fibre neuropathy did not respond to the TTNS even after using the machine for nearly six months. The patient with Idiopathic transverse myelitis did not respond to the TTNS and had abnormal S2, S3 dSEPs. Table 1: The length of TTNS usage before the patient discontinued using the machine. Fifteen patients (45%) patient who found benefit with the TTNS were diagnosed with either multiple sclerosis or Parkinson's disease. Thirty-three patients who found beneficial with the TTNS machine used it for more than three weeks. Maximum number of patients (5) found benefit after using more than four weeks. 40% of patients found benefits from the TTNS after using the machine between 3 and 6 weeks. Two patients had to use it for nearly 15 weeks before noticing any benefit. The distribution of TTNS usage in the benefit and failed groups is given in Table 2. Three months of follow-up appointments revealed six patients (18%) were using the TTNS in the wrong way. Hence, these patients were retrained and given another 3-month follow-up appointment to monitor their progress. Those patients who found benefits with the TTNS continued using the machine daily. Table 2: First report benefit/failure after using the TTNS machine.



## Conclusions

TTNS is an effective treatment for OAB, an alternative to PTNS. 32.7% of patients found the TTNS useful, and 40 % noted improvement after using the machine for nearly six weeks. 43.5 % of patients left the treatment without providing any feedback. Since 3 to 6 six weeks is an effective window for a good outcome, it is essential to follow up with all TTNS patients through telephone or hospital-based appointments for the first six weeks. 18% of patients were using the TTNS machine incorrectly, which suggests that video or personal feedback is essential to reinforce the TTNS instructions. Nearly 10% of patients returned the machine without providing feedback, suggesting more effort is needed to motivate patients before providing TTNS machines.

## References

1. Booth J, Connelly L, Dickson S, Duncan F, Lawrence M. The effectiveness of transcutaneous tibial nerve stimulation (TTNS) for adults with overactive bladder syndrome: A systematic review. Neuourology and Urodynamics. 2018; 37: 528–541. <https://doi.org/10.1002/nau.23351>