Efficacy of Transcutaneous auricular Vagus Nerve Stimulation (taVNS) in aromatase inhibitor-induced arthralgia (AIA): single-center experience

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INTRODUCTION

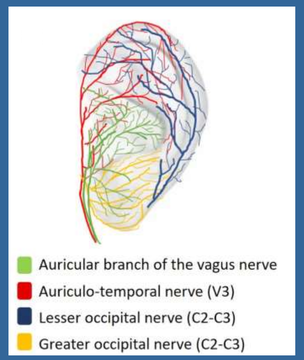
Aromatase inhibitors (AIs : anastrozole, letrozole, and exemestane) are prescribed for women diagnosed with hormone receptor positive breast cancer (BCa).
A major adverse event is AI-induced arthralgia (AIA).
It is associated with premature discontinuation and non-adherence to AIs therapy which in turn is significantly associated with increased mortality in BCa patients.
Declining levels of oestrogen induced by AIs result in increased production of proinflammatory cytokines in particular chondrocytes resulting in joint pain and swelling.
The autonomic nervous system (ANS) plays an important role in the regulation of inflammation. Dysregulation of the ANS is observed in women treated for BCa.
Transcutaneous auricular Vagus Nerve Stimulation (taVNS) has the potential to modulate proinflammatory cytokine production and reduce inflammation by affecting the functioning of the autonomic nervous system. A novel, non-invasive, wearable vagus nerve stimulation device has been created.
Few studies have demonstrated the safety and efficacy of this device after several weeks of treatment, on the intensity of pain secondary to rheumatic pathologies.
We would like to study the effectiveness of non-invasive vagal nerve stimulation for patients with AIA.

METHODS AND MATERIALS

This was a monocentric, retrospective and open-label study evaluating the efficacy and the safety of taVNS to reduce AIA.
Between June 2023 and November 2023, nine patients with chronic pain induced by AIs were referred by medical oncologists to start taVNS.
The patients were asked to give their written consent before the start of taVNS.
Electrode will be placed like an earphone on the left ear. taVNS will be performed for 30 min once or twice by day (pulse rate 25 Hz, pulse width 100 µs) using a TENS eco2 (Schwa-medico).
The efficacy of the treatment was assessed after one month of treatment.

RESULTS

Of nine patients, four described a significant improvement in pain and one moderate improvement. Two patients were lost to follow-up and two patients showed no efficacy.
Patients reported using the device on a daily basis.
Use of the device was well tolerated, without secondary effect.



DISCUSSION

This is the first proof-of-concept study evaluating the feasibility of VNS in AIA. After 4 weeks of stimulation, some patients had a significant reduction AIA without any serious adverse events,
Other studies on rheumatological joint pain tend to show a similar effect.

However, we cannot rule out a placebo effect since there was no control group.
This single-center experience encourages a randomized and sham-controlled trial.

If we confirm this effect with a simple, well-tolerated and cheap technique, we will improve quality of life of thousands of patients yearly and decrease the risk of premature discontinuation and non-adherence to AI therapy, and, finally, reduce breast cancer mortality.

CONCLUSIONS

Despite the small sample size, the results from this proof-of-concept, open-label study are encouraging and indicate a potential therapeutic effect. Further evaluation in larger controlled studies is needed to confirm whether this non-invasive device can offer an alternative, nonpharmacological option for the treatment of AIA.
We are therefore seeking funding to begin this study : "Efficacy of Transcutaneous auricular Vagus Nerve Stimulation in AI-induced arthralgia : a phase 2, randomized, multicenter, single-blind study".

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