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Relationship Between Delayed Pain Flares, Psychogenic Stress and Free Thyroxine in Patients with Phantom Limb Pain

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INTRODUCTION

Phantom limb pain (PLP) involves a variety of painful and debilitating sensations following amputation that are perceived to be coming from a limb that is no longer connected to the body.¹ PLP is a common problem for individuals following an amputation, occurring in 42 to 76% of cases,² with severe pain reported in 5 to 10% of cases.³ Individuals can experience PLP as feelings of stabbing, cramping, burning, clinging, muscle spasm, tingling, and/or phantom limb pain.⁴ While there is no agreement as to the etiology of PLP, current theories involve neuroaxial changes, either distal or via central nervous system remodeling.⁵ As such, PLP may be considered a form of neuropathic pain and may be potentially modulated by factors that have been established to influence the frequency and/or level of pain experienced in other neuropathic conditions.

METHODS

Each day, for 10 weeks, participants completed ratings of pain and stress using visual analog scales (VAS), and daily blood samples for FT4, FSH, and LH were measured. Blood samples were analyzed by the principal investigator daily and refrigerated from the time of collection until mailing, which was conducted on a weekly basis. To ensure the integrity of data, blood samples were mailed to two separate labs which independently analyzed levels of FT4, Thyroxine values from one lab demonstrated internal consistency errors therefore the data from this lab was excluded from analysis.

RESULTS

Serial lag correlations between stress and pain, and stress and FT4, demonstrated the strongest relationship on the tenth segment following a salient psychogenic stressor. The relationship between participants’ ratings of stress and pain ten days later is demonstrated in Figure 2 and Figure 3 (Figure 2 and Figure 3 for participants 1 and 2, respectively). Correlations between these values were r = 0.505 (p < 0.001) for participant 1, and r = 0.055 (p = 0.05) for participant 2. Correlations between ratings of stress and serum FT4 ten days later were r = 0.74 (p < 0.001) for participant 1 and r = 0.02 (p = 0.05) for participant 2. Figures 4 and 5 demonstrate the relationship between ratings of same-day pain and thyroxine for participants 1 and 2, respectively. Correlations between these values were r = 0.47 (p < 0.001) for participant 1 and r = 0.02 (p = 0.05) for participant 2.

CONCLUSIONS

These findings support the hypothesis that FT4 levels related to psychogenic stress are associated with delayed flares in PLP, suggesting that PLP behaves in the same way as other neuropathic pain conditions and that thyroxine acts at the level of the central or peripheral nervous system to upregulate pain pathways.

RESOURCE

Patients with PLP may benefit from understanding the relationship between stress and pain, as this information can help them predict and plan for painful episodes. This may also prevent them from excessively limiting their activities to avoid increasing pain.

REFERENCES


Figure 1. Stress-related latency of headache and modulating hormone cascade leading to increased perceived intensity of neuropathic pain 10 days following the stressor. ¹

Figure 2. Participant 1 visual analog stress scale (VASS) and visual analog pain scale (VAPS) lagged by 10 days.

Figure 3. Participant 2 visual analog stress scale (VASS) and visual analog pain scale (VAPS) lagged by 10 days.

Figure 4. Participant 1, same-day visual analog pain scores (VAPS) and FT4 relationship.

Figure 5. Participant 2, same-day visual analog pain scores (VAPS) and FT4 relationship.

Figure 6. Participant 1 visual analog stress scale (VASS) and visual analog pain scale (VAPS) lagged by 10 days.