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Peer Review

Review of: "The "High-Pressure Pain Cavity" Hypothesis: A Pressure-Volume Model of Myofascial Trigger Points Redefining the Local Twitch Response as an Event of Energy Resupply"

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The manuscript presents a novel **"High-Pressure Pain Cavity" (HPPC) hypothesis** to explain the pathophysiology of myofascial trigger points (MTrPs), particularly the mechanism underlying the local twitch response (LTR) observed during dry needling or acupuncture. The authors propose that chronic strain and inflammation transform the perimysium into a relatively non-compliant, sealed compartment that progressively increases intracavity pressure. Further, it proposes that needle penetration disrupts this cavity, producing rapid decompression, reperfusion, ATP resupply, and ultimately a synchronized contraction interpreted clinically as the LTR. It is conceptually ambitious, interdisciplinary, and potentially stimulating. It connects structural, mechanical, vascular, biochemical, and neuromuscular phenomena within one explanatory framework.

There are a few concerns that need to be addressed to provide the reader with more clarity on the article:

1. The manuscript does not provide sufficient direct anatomical evidence demonstrating that an MTrP is anatomically enclosed by perimysium that functionally forms a sealed compartment filled with free exudate; a proposed cavity has a volume of approximately 1–3 mm^3; pressure within this compartment can become substantially different from the surrounding muscle; and remains isolated from normal interstitial fluid exchange.
2. The pressure-volume model requires mathematical equations or a quantitative model, not just a qualitative response. For example, the authors could introduce a generic pressure-volume relationship and explain which parameters are hypothetical versus empirically measurable.

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3. A more rigorous fluid-dynamic explanation would strengthen the central hypothesis. The author should discuss pressures, interstitial compliance, tissue permeability, capillary infiltration, etc.
4. High intracellular Ca^{2+} dynamics do not imply synchronized contraction and need to be carefully addressed.
5. Kindly strengthen the literature review; it is relatively insufficient.
6. The diagnosis and definition of MTrPs have been debated in the scientific literature. The author should acknowledge the controversies, including reliability, variability, lack of a gold standard, etc.
7. The experiment should be redesigned with appropriate electrophysiological controls, possibly including EMG recordings and different levels/types of neural blockade.
8. There is no evidence of the needle entering the proposed HPPC, such as the exact anatomical location of the proposed cavity; needle-tip location relative to the cavity; probability of cavity penetration; volume of fluid released; or pressure change following needle insertion.
9. MTrPs are heterogeneous, so the manuscript should clarify whether the HPPC model is proposed for which type.
10. Figure 1 requires quantitative information.

Declarations

Potential competing interests: No potential competing interests to declare.