The influence of medical shockwaves on muscle activation patterns and performance in healthy athletes: a preliminary report

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The influence of medical shockwaves on muscle activation patterns and performance in healthy athletes: a preliminary report.

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Introduction

Over the past decade medical shockwaves have been successfully utilised in sports medicine in the area of chronic tendinopathies. The stimulus transduction from medical shockwaves are understood to induce and regulate a favourable biocellular and molecular response that is seen to ameliorate the aberrances associated with various pathologies including that of sports injuries. Our project undertook to investigate what effects medical shockwaves would have on muscle activation patterns and its influence on performance in healthy athletes.

Materials and Methods

Eight amateur right handed elite male athletes from two different sports: Golf (n=4), and Weightlifting (n=4) were recruited for this project. Baseline and post treatment measures utilised quantitative instrumentation and subjective feedback. Flight Scope™ (Golf Technologies USA) recorded golf swing speed, clubface-ball interface, and ball distance. Back-squat routine was utilised for weightlifting where each lifter conducted 5 sets of back-squats carrying 120kgs. The personal best (PB) of each weight lifter for their individual back-squat category was recorded at baseline and utilised to act as marker to measure changes post intervention. Muscle activation patterns assessing onset of muscle activation and energy output in both

golf swing and weightlifting were assessed utilising digital wireless Trigno™ sEMG sensors and the data was tabulated utilising EMG-Works software (Delsys Inc. USA). Six muscles were assessed in golf and eight in weightlifting. Post-ESWT assessments were conducted after a six week interval from the final ESWT session. Medical shockwaves were propagated by an electrohydraulic generator (CellSonic, Apex MediTech), where 500 acoustic impulses were administered on each muscle over three sessions at one week intervals.

Results

Flight scope recorded an increase in golf swing speed (baseline avg: 140.21km/h – post ESWT avg: 147.12km/h [+10.49%]), clubface-ball interface (baseline avg: 1.32m/sec – post ESWT avg 1.46m/sec [+11%]), and ball distance (baseline avg: 143.25m – post ESWT avg: 167.4m [11.6%]) from baseline. Muscle activation patterns in golf recorded faster muscle activation (baseline avg over 6 muscles x 4golfers: 1.35sec – postESWT avg 0.89sec), and energy output (baseline avg over 6 muscles x 4golfers: 487.44üv/swing – postESWT 575.93üv [+8.46%]) across each individual from baseline. In weightlifting muscle activation recorded faster onset patterns (baseline avg over 8 muscles x 4 weightlifters: 1.02sec – postESWT avg 0.92sec) from baseline, while energy output recorded increased output levels during 120kgs loaded back-squat routine (baseline avg over 8 muscles x 4 weightlifters: 4,043.03üv/backsquat – post-ESWT 5394.36üv/backsquat [+33.45%]) from baseline. Personal best of each weightlifter increased in 120kgs loaded back-squat (baseline avg: 655kgs – post-ESWT: 738kgs [11.2%) from baseline.

Discussion

Our project undertook to determine the influence of medical shockwaves on the activation and performance of muscle tissue in health athletes. Observations utilising sport specific measurement instrumentation and sEMG suggest that medical shockwaves in this instance had a positive influence on muscle activation and energy output patterns, which in-turn influenced performance, and could potentially reduce overuse and fatigue related pathophysiology. The benefits from ESWT demonstrated a positive influence six weeks post intervention suggesting a fairly good treatment outcome survival-curve. Over the past decades medical shockwaves have been known to promote a positive homeostatic return of several pathologies

including chronic unresponsive sporting injuries. Although the impact and influence of medical shockwaves on the cellular and molecular signalling and response pathways is yet to be completely elucidated, it is considered that the acoustic stimulus from medical shockwaves influence the cellular-matrix through receptors and mechanosensory substances promoting favourable cellular interaction, communication and integrity. This cellular influence from medical shockwaves may be actively reproduced in healthy subjects and not merely restricted to pathological conditions alone. No adverse incidence was reported from this project.

Conclusion

Given the observations of our study it is plausible to suggest that medical shockwaves may potentially induce and regulate a favourable biocellular and molecular response in fatigued tissue of healthy athletes offering the potential to reduce and even prevent overuse syndromes. Further investigation is warranted in this area.

Keywords

Muscle fatigue, overuse syndromes, sports injury, sports performance, ESWT, mechnotransduction, cellular-matrix cell-cell communication.

Author contributions:

KC – Study conceptualisation and design, ESWT therapist, manuscript author and conference presenter.

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