

SW on Human Platelet-Rich Plasma (PRP) and Osteoblasts

Biagio Moretti (1), A. Notarnicola (1), R. Tamma (2), A. Zallone (2), L. Moretti (1), C. Citarella (3), D. Dimonte (3), V. Patella (1)

Institutions :

- 1) Department of Clinical Methodology and Surgical Techniques, Orthopedics Section
- 2) Department of Human Anatomy and Histology
- 3) Blood Transfusion Service, University of Bari, Italy

Device and producing company:

Minilth SL1, Storz

Introduction:

ESWT involves mechanical disturbances that can result in mechanical stimulus to a large number of cell lines. The aim of this study was to assess the interaction of different cell populations, osteoblasts and platelets, after the stimulation of only one of them.

Methods:

Human platelet-rich plasma (PRP) was exposed to a single ESW treatment (0.16 mJ/mm², 500 impulses) then added to mouse calvaria osteoblast (OB) cultures. Cell activity was evaluated by Western-blot and real time-PCR experiments.

Results:

We found an increase of Growth Factors involved in OB proliferation and differentiation. In addition, the increase of the markers of osteoblast maturation (RUNX2, Collagen I and Osteocalcin) was demonstrated. Our findings suggest that the recruitment of platelets is a critical step in the bone reparation process and is enhanced by ESW treatment.

In fact, Insulin Growth Factor-1 and IGF-Binding Protein-3 are proposed to play a chemo tactic and mitogenic role in differentiation and proliferation of OB. Shock waves can produce activation of platelets, and drive OB to express genes for osteogenesis.

Discussion:

Previous studies showed SW positively influence OB proliferation modulating membrane permeability and intracellular signalling. In this study, we found that these effects can also be achieved by the stimulation of other cells. Therefore, it is probable that during applications in vivo the stimulation of shockwaves could be the sum of the interaction of different cell lines.

Conclusion:

In recent years the application of PRP has emerged as a potential solution in bone and tendon injuries. The present results demonstrate that PRP could be added to SW to increase the osteoblastic activity.