17. Metabolic Factors, Biomechanical Stress and Estrogen Impact on Osteoblasts.

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AIM- The objectives of this study were to investigate the possible effect of biomechanical stress and estrogen on human osteoblasts derived from AIS patients (who underwent scoliosis surgery) and healthy subjects (surgery for bone trauma).

METHODS- Human osteoblasts were derived from tissues obtained at surgery, and cultured in presence or absence of estradiol. We used microarray analysis to examine differences in the gene transcription profile between primary human osteoblasts RNA extracted from scoliotic patients was compared to the RNA of healthy patients. In addition, osteoblasts were exposed to biomechanical stress (0-2 g/cm2) and then examined for changes in their cell proliferation and the level of biochemical factors produced by cultured cells such as nitric oxide (NO), cyclooxygenase (COX-2), osteopontin (OPN) and Adenosin triphosphate (ATP).

RESULTS- Biomechanical stress differentially influenced cell proliferation of the control osteoblasts to scoliotic cells. Following the biomechanical stress, we found that NO, COX-2, OPN and ATP levels were increased in both control cells and AIS cells, but a significantly higher levels of NO and COX-2 were observed in scoliotic osteoblasts . Using microarray analysis, we found that 86 genes were expressed at relatively higher levels in AIS osteoblasts compared to controls, while 59 genes were expressed at lower levels after exposure to estrogen. These genes are involved in various bone regulatory and developmental pathways.

CONCLUSION AND SIGNIFICANCE- Our study demonstrated that osteoblasts could be altered by biomechanical stress. Hormonal factor is also involved in the gene expression of various genes. These factors could be associated to the bone cells metabolic pathways. Our study demonstrated changes in gene transcription between osteoblasts and control cells and provided a previously unrecognized list of estrogen up- and down regulated on bone cells. According to their function and their involvement in biological processes, these genes are mainly involved in bone metabolism and embryonic development.

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