Prepared for:
TENEX CORPORATION

EVALUATION OF THE VIBRATION DAMPENING PROPERTIES OF TENEX® ELBOW SHOCK ABSORBER

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INTRODUCTION

The Tenex Elbow Shock Absorber (ESA) produced by Tenex Corporation is a semi-spherical container of high impact polycarbonate (IZOD for 0.125" 14 ft/Lb. Minimum), ultraviolet resistant and filled with 99% distilled Hg. This device, worn on the wrist, weighs 50gr. and according to the manufacturer, is designed to reduce vibrations to the wrist and elbow of a tennis or golf player during ball impact and consequently alleviate pain and symptoms of Tennis Elbow. This study is limited to the evaluation of ESA to dampen vibrations

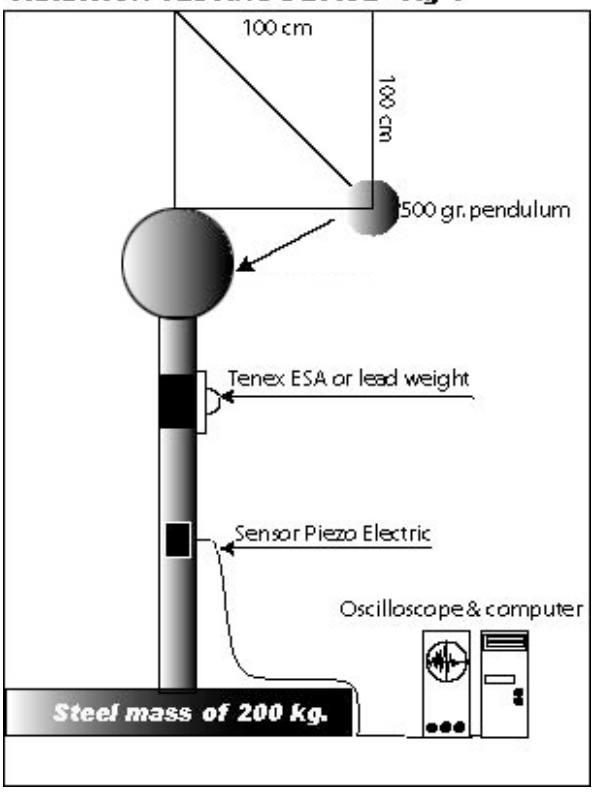
TESTING THE EFFECTIVENESS TO REDUCE VIBRATIONS

This is achieved by measuring the amplitude and duration of the vibrations produced by impact to an artificial arm. The results are compared to the effect produced under similar conditions when:

1) Nothing is attached to the artificial arm
2) A solid lead mass of the same weight as Tenex ESA is attached to the arm.
3) Tenex ESA attached to the artificial arm.

PROCEDURE

VIBRATION TESTING DEVICE - Fig 1



A device composed of an arm of 35 cm in length by 10 cm in diameter is fixed at the bottom end to a steel base weighing 200kg.

The arm is designed to imitate a human arm: An artificial skin cover, formed of a latex material, simulates the skin that in a human arm would contribute to dissipate vibrations is drawn over a metal rod that models bones. Between the latex skin and the metal rod we inserted several liquid filled plastic tubings to simulate blood vessels.

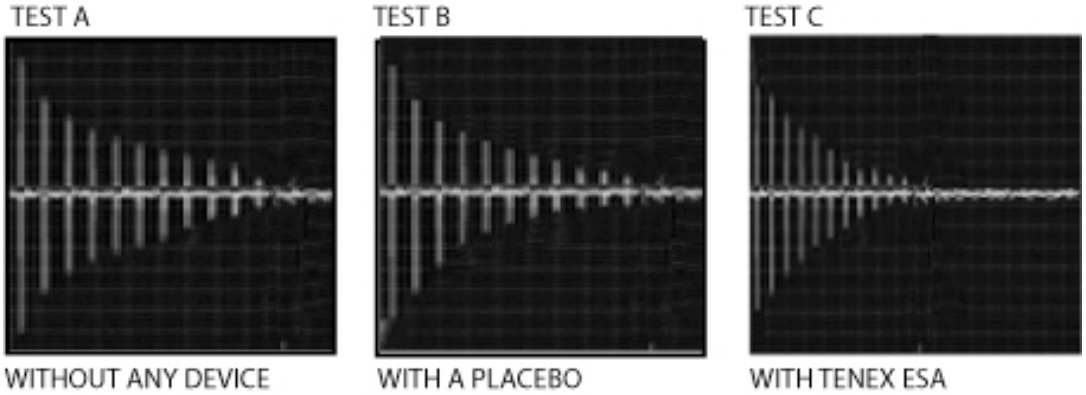
This vibration producing device is not intended to be an exact reproduction of a human arm, it is only intended to simulate conditions that will allow some interpretations and measurements of vibrations created by consistent and repeated impacts.

- ESA (or a placebo) is attached 10 cm below the upper part of the arm
- 2 cm below the base of ESA a piezo-electric sensor is attached to the arm. The sensor is in turn connected to an oscilloscope to register vibrations and connected to a computer to average and analyze data.
- The top part of the arm is hit by a standardized pendulum/, six times for each test.
    - For each test, the 500 gr. steel pendulum is swung from a fixed distance of 100cm.
    - Ten successive series of tests are conducted as follows:

TEST A: WITHOUT ANY SHOCK ABSORBER:
Testing is carried out under the above conditions without the use of any shock absorber to measure vibrations produced by the device itself.

TEST B: USING A LEAD PLACEBO:
Testing is carried out under the same conditions attaching a solid lead weight of 50 gr.

TEST C: USING TENEX : Testing is carried out under the same conditions attaching Tenex ESA



COMPUTER INTERPRETATION OF DAMPENING CURVE
The above photos represent an average computerized representation of each test performed (A,B,C). It shows the amplitude/time factors performance for each test and allows for a direct reading of the results.

RESULTS:

We observed that test A and test B had little or no effect on the dampening of the vibrations produced by the Vibration Device. While in Test C, using ESA, we observed a marked reduction in both, the duration and the amplitude of the vibrations, by respectively 50 and 70 per cent

CONCLUSIONS:

These results represent a significant reduction in vibration. Assuming that exposure to vibrations is the main cause of Tennis and Golf Elbow, in our opinion, the intended application to use ESA as a shock absorber to protect the arm and elbow of a tennis and golf player, against the adverse effects of vibrations, are consistent with our observations. We recommend further tests using actual players and we also recommend testing ESA in industrial applications using power tools, impact hammers, etc.

Dr. G.P. Krebs
Director of Research

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