The concept of SparkWave™ therapy-assisted penile tissue hyperplasia:
A non-invasive alternative to augmentation phalloplasty
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INTRODUCTION & AIM
SparkWave™ therapy (SW™T) is a special kind of shock wave therapy which is used as a first line therapy for vasculogenic erectile dysfunction (ED) in many developed countries. It works on the basis of angiogenesis and tissue regeneration.

Augmentation phalloplasty surgery, also known as penis enlargement surgery, is usually performed in patients with phallic dysmorphic disorder (PDD) and patients with microphallus. It is done to increase penile length and girth (circumference).

The aim of this research project is to assess the possibilities to induce penile tissue hyperplasia by SW™T and to establish this non-invasive procedure as an alternative for augmentation phalloplasty surgery.

MATERIALS & MECHANISM
Usage of penile traction device and penile vacuum pump causes the penile tissue to be stretched and expanded. As a result, microtears appear in the penile tissue. Due to body’s own repair mechanism, these microtears heal by the mean of cell proliferation which results in penile tissue hyperplasia. This same principle is used by some African tribes to enlarge lips and ears. The acceleration and completion of the repair process depends on several factors. One of these factors is angiogenesis which ensures the proper environment for cell proliferation by the means of improved hemodynamics.

SW™T induces angiogenesis in the local small blood vessels and the release of angiogenic growth factors such as VEGF, eNOS and PCNA. That is why SW™T can be utilized to ensure acceleration and completion of the repair process of penile tissue microtears through angiogenesis. Moreover SW™T induces migration of mesenchymal stem cells to the treated area. The "proliferation and differentiation" properties of the stem cells can be utilized to further accelerate and complete the repair process. These stem cells also induce angiogenesis because they produce cytokines and send signals to the surrounding, pre-existing cells and initiate proliferation, differentiation and the release of growth factors.

For continuation of angiogenesis, frequent vasodilatation is required which can be ensured by increased production of NO. NO is produced from the amino acid L-arginine via the enzymatic action of the endothelial nitric oxide synthase (eNOS). Using L-citrulline supplementation ensures a constant bioavailability of L-arginine thus frequent vasodilatation occurs due to increased NO production which is essential for improved hemodynamics and supports the process of angiogenesis.

RESULTS & CONCLUSION
As a result of the combination of angiogenesis (inducing vasularization and improving hemodynamics) and cell proliferation (pre-existing cells and stem cells), penile tissue hyperplasia occurs which results in increased penile length and girth (circumference) permanently without any damage to erectile function. SW™T-assisted penile tissue hyperplasia can be considered as a non-invasive alternative for augmentation phalloplasty surgery. To assess its potentiality, clinical trials are required.