

## **Novel New Approach to Removal of Cemented Stems Using Alternating Current Generated Electro Magnetic Force with Hand Pressure Alone**

Gerhard Emil Maale, Matthew Francis Maale

**INTRODUCTION:** Induction furnaces using electromagnetic forces (EMF) have been used to shape metal alloys with 3-d designs at certain temperatures. Surface heating can occur at lower temperatures without disruption or distorting the metal alloy. This surface heating can be controlled to be able to heat up surrounding compounds in a controlled way, uniformly. The question is : "Can EMF be used in the removal of cemented stemmed prostheses without causing heat damage to surrounding tissues or interfaces?"

**METHODS:** Two porous coated implants had their stems wrapped with Stryker Simplex cement and allowed to harden. The stems were placed in a 8-inch PVC pipe on a ceramic holder. A Fluke thermos-imager was the focused on the cemented stem for both a knee and hip. A Yokagawa thermocouple was then applied to each implant adjacent to the cement. An EMF generator was then connected to an EMF malleable copper coil with circulating water hose wrapped around it through a hose. There were 8 turns of the coil. The EMF generator was set at 7.0 KW, 10 amps, and 700 volts. Temperatures generated on the prosthesis was recorded.

### **RESULTS:**

It took 5 minutes to heat the prosthesis to 150-160 degrees centigrade on the surface. Both cement mantles were easily removed with hand pressure alone. The melting zone seen visually on analysis of the cement was only 1mm-2mm .In addition the cement gave of some smoke at reaching 150 degrees. The surrounding cement wasn't injures or hot past the 1-2mm burn zone in the cement adjacent to the prosthesis.

### **DISCUSSION AND CONCLUSION:**

EMF generated through malleable, water cooled, copper coils can heat bone cement on the surface of cemented orthopedic implant stems and allow for cement removal with hand pressure alone. The implant must achieve temperatures of 150 degrees centigrade. This made allow for the easier removal of cemented implants without damage to surrounding cement or hard or soft tissues. This can be done in five minutes when the transformer is set at 7.0 Kilowatts, 10 amps and 700 volts. The external malleable copper coils do not soft tissue just the prosthesis and is water cooled to prevent heating up the coils. This has application for intra-operative applications as the coils will be sterilizable, mallable, and quick connectors to a non sterile transformer. Thi.s can same hors at the time of revision of total joints