A Novel Method to Correlate Weight Gain and Increased Risk of Metallosis in Metal-On-Metal Hip and Knee Implant Patients

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Metallosis is a prevalent condition that is an immune response secondary to metal particulate buildup in the body. Cobalt is a primary component in artificial metal joints, and concentrations of it over 6 micrograms per liter result in tissue necrosis and pseudotumors. This study focuses on hip and knee implants in which metal heads are used, especially dominant in the over 12,000 reported cases of joint metallosis over the past years. The grinding of the joints facilitates the release of these metal particles. The hypothesis behind this study stated that overweight individuals place greater stress on leg joints, advancing the progress of metallosis. Sample collection was performed using a 150-Watt induction motor fitted with a cobalt-chromium alloy head. This was rotated against another ingot in distilled water for a period of 3 minuted, allowing metal particles to accumulate in solution. 2.268, 4.526, and 6.804 kg masses were consecutively added, collecting 5 trials of samples for each mass. a 1M luminol solution reacted through chemilluminescence to generate a specific intensity of light in a spectrophotometer with half of the sample volume. Comparing these values against a standard curve revealed the moles of cobalt in solution. The rest of the sample volume was used in a voltaic cell redox reaction, denoted by Co(s)/Co(2+)//Cu(2+)/Cu(s), to produce cobalt ions which were used to precipitate cobalt (II) hydroxide. Stoichiometric analysis was used to calculate moles of cobalt in those samples. The data showed a 5 mol variance between the greatest mass and least mass in both tests. This data lead to the conclusion that overweight patients so have a greater tendency to develop metallosis in metal-on-metal joint implants.