Implantable Cardioverter Defibrillators and Geomagnetic Activity

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Introduction: Small studies suggest that geomagnetic activity (GMA), which is mainly influenced by solar radiation, could relate to the occurrence of life-threatening arrhythmias. However, appropriately powered studies on this topic have not been conducted. Our goal was to investigate whether the frequency of therapies delivered by implantable cardioverter defibrillators (ICD) correlates with daily GMA.

Methods: The LATITUDE database was analyzed for the frequency of ICD shocks and anti-tachycardia pacing (ATP) therapies on a daily mean of 59,468 ± 11,397 patients being monitored between January 2009 to May 2012. Daily GMA indexes obtained from US Space Weather Prediction Center were graded as level I (quiet), II (unsettled), III (active) and IV (storm).

Results: The distribution of days according to GMA was: level I 75%, II 18%, III 5% and IV 2%. There were 1.29 ± 0.47 shocks per 1000 person on level I days, 1.17 ± 0.46 on level II, 1.03 ± 0.37 on level III and 0.94 ± 0.29 on level IV. ATP therapies per 1000 person were: 9.29 ± 2.86 on level I days, 8.46 ± 2.45 on level II, 7.92 ± 1.80on level III and 7.83 ± 2.28 on level IV (Figure). A significant inverse correlation between GMA level and number of ICD therapies was found ($p < 0.0001$ for both ICD shocks and ATP).

Conclusions: In patients with ICD, therapies were delivered less frequently on days of higher GMA, suggesting a mildly protective rather than harmful effect of solar storms. Further studies are needed to determine the mechanisms of the relationship between Earth's magnetic field, solar radiation, myocardial arrhythmogenicity, and ICD function.