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Characterization of CMS Hadron forward calorimeter upgrade, photomultiplier tubes

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For the preparation of the CMS Phase I upgrades, which consisted of the replacement of the photomultiplier tubes, we tested 1800 Hamamatsu R7600U-200-M4 photomultiplier tubes at the University of Iowa Photodetector Test Laboratory. Among the tests performed, measurements of gain, response uniformity and linearity can be listed. The new photomultiplier tubes will provide better light detection performance, a significantly reduced background and unique handles to recover the signal in the presence of background. This report will provide the details of the photomultiplier tube measurements; describe the calorimetry upgrade and the nature of the essential upgrade elements with supporting test results.

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Photodynamic therapy in combination with CO₂ laser for the treatment of Bowen's disease

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Background: Photodynamic therapy (PDT) involves the activation of a previously administered photosensitizing agent by visible light to induce tumor necrosis. Photosensitizers are topically applied in the treatment of skin tumors to avoid systemic side effects.

Objectives: In this study, we evaluated the feasibility and efficacy of aminolevulinic acid (ALA) as a photosensitizer (ALA-PDT) in combination with CO₂ laser in the treatment of Bowen's disease (BD; intra-epithelial squamous cell carcinoma).

Methods: Twenty-two lesions from 18 patients were randomized into two groups: 11 lesions were treated with topical ALA-PDT (180 J/cm² at 100 mW/cm²) + CO₂ laser for 1-3 sessions. The remaining 11 lesions were treated with CO₂ laser alone, serving as control group. All patients were reviewed at ≤1-week intervals. Biopsies were taken from BD lesions prior to treatment. The initial evaluation was undertaken 1 month after treatment and biopsies were harvested for histological evaluation. Patients who did not respond to the three sessions of treatment were referred to surgical treatment.

Results: In the ALA-PDT+CO₂ laser group, 72.73% (8/11) of BD lesions showed complete remission, with an overall clearance of 90.91%, and only one recurred (9%) during follow-up. Local side effects included mild erythema, edema, erosion and burning and/or stinging sensation. No systemic side effects were observed. In the control group, 63.63% (7/11) of lesions had complete remission, and the overall clearance was 54.55%. However, five lesions (45.45%) had recurrence. Local side effects included mild to moderate edema, erosion, ulceration, delayed healing, prolonged pain and scarring. There existed a significant difference in recurrence rate between the two groups ($P < 0.05$). Moreover, after ALA-PDT plus CO₂ laser treatment, complete necrosis was observed in responsive lesions, and 3 months later the atypical BD cells were replaced by normal keratinocytes.

Conclusions: Topical ALA-PDT in combination with CO₂ laser is safe, effective and is associated with low recurrence and reduced side effects.

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