

Does Hyperbaric Oxygen enhance the effect of photodynamic therapy in patients with advanced esophageal carcinoma? A clinical pilot study.

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Maier A; Anegg U; Tomaselli F; Rehak P; Sankin O; Fell B; Renner H; Pinter H; Smolle-Juttner FM; Friehs GB
Department of Thoracic and Hyperbaric Surgery, University Medical School, Graz, Austria.

BACKGROUND AND STUDY AIMS:

Experimental studies have shown that the cytotoxicity of porphyrins and related substances is mediated mainly by singlet oxygen and that hypoxic cells are less affected by porphyrins and light. In a clinical pilot study we assessed the use of photodynamic therapy (PDT) under hyperbaric oxygen (HBOT), compared with PDT under normobaric conditions, in patients with advanced esophageal carcinoma.

PATIENTS AND METHODS:

After diagnostic work-up and staging, photosensitization in all patients was carried out using hematoporphyrine derivate (HpD) (2 mg/kg bodyweight 48 hours prior to PDT). We then applied light at 630 nm (KTP-Nd: YAG laser with DYE box) at dose of 300 J/cm, delivered by a fiber with a radial light-diffusing cylinder (length 1 cm), inserted through the biopsy channel of the endoscope. Of the patients, 14 (12 with stage III cancers, and two with stage IV cancers) were treated by PDT alone, and 17 patients (15 with stage III cancers, and two with stage IV cancers) received PDT under HBO at a level of 2 absolute atmospheric pressures (ATA). Transcutaneous PO₂ levels of 500-750 mm Hg under HBO, compared with transcutaneous PO₂ levels of 60-75 mm Hg under normobaric conditions, were measured.

RESULTS:

Improvements regarding dysphagia and stenosis diameter were obtained in both treatment arms with no significant differences (P = 0.36 and 0.14, respectively). The tumor length also decreased in both groups and showed a significant difference in favour of the PDT/ HBO group (P = 0.002). Kaplan-Meier statistics showed median overall survival for the PDT group and the PDT/HBO group as 7.0 and 12 months respectively. The 12-month survival rate was 28.6% for the PDT group and 41.2% for the PDT/HBO group. Logrank test showed a difference in survival in favor of the PDT/HBO group (P = 0.059). No major treatment-related complication occurred, and the 30-day mortality rate was 0%.

CONCLUSIONS:

Combined PDT/HBO represents a new approach in the treatment of esophageal cancer which, in this pilot study, appears to have enhanced the efficiency of PDT.