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Hyperbaric oxygen therapy for late radiation-induced tissue toxicity: prospectively patient-reported outcome measures in breast cancer patients

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Abstract

Introduction: This study examines patient reported outcome measures of women undergoing hyperbaric oxygen treatment (HBOT) after breast-conserving therapy.

Method: Included were 57 women treated with HBOT for late radiation-induced tissue toxicity (LRITT) referred in the period January 2014–December 2015. HBOT consisted of (on average) 47 sessions. In total, 80 min of 100 % O₂ was administered under increased pressure of 2.4 ATA. Quality of life was assessed before and after treatment using the European Organization for Research and Treatment of Cancer (EORTC) QLQ-BR23, and a NRS pain score.

Results: Fifty-seven women were available for evaluation before and after treatment. Before HBOT, patients had severe complaints of pain in the arm/shoulder (46 %), swollen arm/hand (14 %), difficulty to raise arm or move it sideways (45 %), pain in the area of the affected breast (67 %), swollen area of the affected breast (45 %), oversensitivity of the affected breast (54 %), and skin problems on/in the area of the affected breast (32 %); post HBOT, severe complaints were still experienced in 17, 7, 22, 15, 13, 15, and 11 % of the women, respectively. Differences were all significant. The NRS pain score improved at least 1 point (range 0–10) in 81 % of the patients ($p < 0.05$).

Conclusion: In these breast cancer patients treated with HBOT for LRITT, the patient-reported outcomes were positive and improvements were observed. HBOT was a well-tolerated treatment for LRITT and its side-effects were both minimal and reversible.

Keywords: Breast cancer, Radiotherapy, Radiation toxicity, Fibrosis, Pain

Introduction

In the Netherlands, around 14,000 women are diagnosed each year with invasive breast cancer; in addition about 1,900 women are diagnosed with a ductal carcinoma in situ [www.oncoline.nl]. According to the GLOBOCAN series of the International Agency for Research on Cancer, one of the most commonly diagnosed cancers worldwide is breast cancer (1.67 million) [1]. Among women in the Netherlands, the cumulative lifetime breast cancer risk is

12–13 % [www.oncoline.nl]. Early detection (particularly via national breast cancer screening and improved systemic therapy) is the main factor to improve breast cancer prognosis [www.oncoline.nl]. In ≥ 60 % of patients, breast-conserving surgery is applied followed by radiotherapy. A boost dose is added in patients with a high risk of developing a true local recurrence.

When radiation is used to treat cancer it also (partly) affects a variety of critical surrounding normal tissues which can become hypocellular, hypovascular and hypoxic, frequently referred to as ‘3 H tissue’ [2]. The hypoxic status of tissues can be counteracted to some extent by oxygenation of normal cells with hyperbaric oxygen therapy (HBOT). The effects of hyperbaric

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