Hyperbaric Oxygen (HBO) as a Novel Treatment Modality for Radiation Cystitis

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Oxygen inhalation in high percentages and under high pressure has been extensively applied to the prevention and treatment of complications after radiation therapy [1]. Hyperbaric oxygen (HBO) therapy indications include the prevention of osteoradionecrosis after dental extraction, the treatment of mandibular osteoradionecrosis, the management of haemorrhagic cystitis resistant to conventional treatments and other urological clinical entities [1,2].

Radiation cystitis may occur within 2 months to more than 20 years following completion of pelvic radiotherapy. The incidence ranges from 5 to 12%, with haemorrhage presenting in up to 9% of cases. Furthermore, radiotherapy for prostate cancer may lead to moderate or severe haematuria in 3-5% of cases [3]. Radiation cystitis has been treated in various ways. Bladder irrigation constitutes the first-line treatment while intravesical instillations with several agents (alum, silver nitrate, phenol or formalin) are considered as second-line treatments. Several oral and intravenous agents are administered either concomitantly or as a third-line option but bear significant side-effects. Among them the most commonly applied are aminocaproic acid, tranexamic acid, corticosteroids, oestrogens, antibiotics, prostaglandins and sodium pentosan polysulphate. Given the fact that these treatments do not cure the radiation-induced cystitis, nor prevent recurrence of severe haematuria, there is a strong need for a therapeutic procedure that corrects the underlying pathophysiology.

Radiation cystitis is typically characterized by obliterator endarteritis of small blood vessels that lead to acute and chronic ischemia of the bladder wall and eventually to smooth muscle fibrosis due to cellular hypoxia. HBO therapy with resulting hyperbaria, increases bladder’s tissue oxygen tension and hyperoxia enhances neovascularization and growth of normal tissue [3]. Angiogenesis is stimulated by tissue macrophages responding to the steep oxygen gradient. Tissue oxygen remains near normal levels for many years following HBO therapy, implying that the angiogenesis is essentially permanent. Vasoconstriction, cease of bleeding and improvements of tissue healing and immune function constitute additional beneficial effects of HBO. Therefore, HBO is the only treatment that reverses the vascular radiation-induced pathophysiology.

Although several studies have been published on HBO therapy for radiation cystitis, none is randomized or controlled; therefore the results of such studies are warranted [4]. The total number of patients included as a whole was 269, with a mean number of 32 HBO treatments. In all these studies HBO was used as a secondary treatment option. They presented a relatively high complete response rate (68.88%), defined as complete cessation of bleeding and lack of need for transfusion in combination with the disappearance of endoscopic findings and concomitant normal bladder findings in repeat biopsies. Recurrence rate was 13.63% concerning studies with available data in that field, while cystectomies as definite treatment were performed in 13.9% of cases. Further prospective studies on HBO in a larger cohort of patients who have not received any previous treatment are needed, in order to confirm the existing promising results for the treatment of radiation cystitis.

References


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Received October 22, 2012; Accepted October 22, 2012; Published October 24, 2012


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