Management of ischemic hemorrhagic cystitis with hyperbaric oxygen therapy

A. E. LOPEZ, S. RODRIGUEZ, and I. FLORES

Urologist in Private Practice in Laredo, Texas; and Senior High School Students at United High School, Laredo, Texas

Lopez AE, Rodriguez S, Flores I. Management of ischemic hemorrhagic cystitis with hyperbaric oxygen therapy. Undersea Hyper Med 2001; 28(35-36)—We report a case of a T8 paraplegic woman who experienced necrosis of the bladder due to inadvertent chronic over distention. After bladder repair, the patient suffered from severe ischemic hemorrhagic cystitis. Despite many attempts to control the bleeding with standard treatments, the hematuria continued. Although hyperbaric oxygen (HBO₂) therapy has not been proven to be helpful in patients with hemorrhagic cystitis not related to radiation or chemotherapy, the physiopathologic mechanisms of the cystitis, involving ischemia, led us to believe that our patient would benefit from HBO₂ therapy in analogy to the approved use of HBO₂ therapy in radiation cystitis. Since the use of HBO₂ therapy has not been previously reported in this situation, we met with some hesitation from the HBO₂ therapy department. After reviewing the literature and discussing the case, a medical panel reached a consensus to allow us to commence the treatment. The patient had a remarkable response, and remains without hematuria 6 mo. after treatment.

hemorrhagic, cystitis, hyperbaric oxygen, management, ischemia

A 54-yr-old, morbidly obese (weight 252 lb), Hispanic female, who had become T8 paraplegic after spinal surgery performed to treat spinal tuberculosis, was transferred to our hospital for extended care. Shortly after admission she developed gross hematuria. A Foley catheter was inserted, the bladder was irrigated free of clots, and the patient was started on continuous bladder irrigation with normal saline. A few hours later it was noted that the irrigant was not draining adequately, and attempts to manually irrigate the catheter were unsuccessful.

A previous computed tomography scan of the abdomen and pelvis done about 1 wk earlier showed a massively distended bladder, which at that point was not being drained. Due to her paraplegia, body habitus and a perceived “adequate urine output” the chronic overdistention of the bladder was not identified for some time. However, acute over-distention of the bladder does not seem to have been a major factor in the ischemic process, as the difference between the fluid for irrigation and the Foley output was estimated to be less than 500 ml; in addition, the diaper was wet. A cystogram disclosed a massive bladder rupture with absence of much of the dome of the bladder. This suggested necrosis of the bladder due to chronic over-distention. The patient was transferred to the operating room, where the bladder was exposed using an extra peritoneal approach. Findings were consistent with massive necrosis of the dome of the bladder, and a large segment of the bladder wall was found to be floating in the pelvis, completely separated from the rest of the bladder. This was consistent with necrotic tissue with fibrinoid membranes. The bladder was tenuously repaired due to the questionable viability of the remaining walls. A large suprapubic tube was left in place as well as multiple pelvic drains.

The patient had a fairly successful recovery, but 2 wk later she again developed gross hematuria. A repeat cystogram showed that the bladder had healed well and there was no extravasation. Cystoscopy showed chronic inflammatory changes and massive ulceration of the mucosa with generalized oozing. Attempts at fulguration were ineffective due to the disseminated nature of the process. We made several conservative attempts to treat the hemorrhagic cystitis including irrigation with alum 10%, silver nitrate 10%, and Carboprost; all failed to control the bleeding. The patient received 5 units of packed red blood cells within 12 days. Considering the likelihood that ischemia was playing a major role in the physiopathology of this intractable bleeding, we considered the possibility of using hyperbaric oxygen (HBO₂) therapy as part of the treatment.

A significant body of literature is available to support the use of HBO₂ as an adjunctive treatment to medical and surgical care in clinical situations of impaired oxygen delivery (1–3). The benefits of HBO₂ therapy in the treatment of radiation-induced hemorrhagic cystitis

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are well recognized. The pathogenesis of the cystitis involves progressive obliteratorative endarteritis of small vessels with consequent hypoxic tissue. These eventually break down and develop non-healing, spontaneous, or trauma-induced ulcerations. A similar mechanism with undistinguishable hystopathologic features has been postulated for chemotherapy-induced cystitis (4). Therefore the underlying mechanism is ischemia, which is the same mechanism believed to be responsible for the bladder necrosis in our patient. Based on the available scientific literature, we believed that HBO2 therapy was justifiable in analogy to approved indications in radiation cystitis and chemotherapy-induced cystitis. The postulated mechanism for the beneficial effect of HBO2 therapy is by elevating the oxygen gradient between the damaged hypoxic urothelium and the normal tissues surrounding it. This increases the oxygen tension in the tissues, stimulating neovascularization and formation of granulation tissue. The mechanism of neovascularization is associated with macrophage migration and production of macrophage-derived angiogenesis factor and other growth factors (4,5).

Initially, we met with some resistance from the hyperbaric medicine department. They argued that this was not an accepted indication for HBO2 therapy, as it has been reported only for use in hemorrhagic cystitis related to radiation therapy (5–7) and chemotherapy (4,8,9). Because the patient did not respond to any other therapeutic efforts, and in analogy to approve indications for HBO2 therapy where ischemia is a physiopathologic factor, she was accepted for HBO2 treatment on a compassionate basis.

The patient received 19 consecutive HBO2 treatments. She received 2.5 atm for 90 min with two air breaks every 30 min, for a total of 100 min. The treatments were administered 6 days a week, with a break on Sunday. A remarkable response was observed; by the third treatment the hematuria was substantially reduced and it resolved shortly thereafter. Six months after this treatment, the patient remains without significant gross hematuria, despite a chronic indwelling Foley catheter. She has had short-lived episodes of mild hematuria lasting 2–3 days related to catheter trauma and infection. These episodes resolved spontaneously. Intermittent catheterization has not been possible due to lack of family support and her body habits, which makes insertion of the catheter difficult. Follow-up cystoscopy and biopsy were not done because the patient was a high operative risk due to co-morbid conditions, including chronic obstructive pulmonary disease, and it was not absolutely necessary from the clinical standpoint.

Hyperbaric oxygen therapy has been proven effective for patients with radiation cystitis or chemical exposure; however, its use in other types of hemorrhagic cystitis has not been reported. Our patient, who most likely had an ischemic underlying process, benefited greatly from this treatment despite failing many other accepted approaches for hemorrhagic cystitis. Therefore, we recommend further clinical and laboratory research to confirm the potential benefit of HBO2 therapy in the treatment of ischemic hemorrhagic cystitis.

Mailing address for Dr. Lopez: 201 West Del Mar Boulevard, Suite 15, Laredo, Texas 78041. Manuscript received March 2001; accepted June 2001.

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