Case report

Hyperbaric oxygen therapy for vulvar necrotizing fasciitis

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Abstract We report the use of hyperbaric oxygen (HBO) therapy to treat vulvar necrotizing fasciitis (NF), a complication of using hygenic ped for abnormal uterine bleeding. Our patient was 38-year-old, nulliparous, not married and virgin. She had a history of abnormal uterine bleeding for 2 months. When she came to our clinic her complaint went on and biochemical tests, ultrasonography and endometrial biopsy was made. The result of the pathology was simplex endometrial hyperplasia without atipia. In vulvar inspection the patient had a mild ulcerative lesion which was specially placed at the right side of the vulva markable, including right labium majus and left labium minus and a little bit clitoral region. The classic symptoms of NF were seen, such as local pain, smooth shiny skin and partial skin darkenings. She had a medical and local surgical treatment for 2 weeks, after we were not successful we reffered the patient to Hyperbaric Oxygen Therapy Center. After totally 25 sessions of therapy the vulvar lesions improved dramatically. This case showed that HBO is a successful therapy modality for vulvar necrotizing fasciitis due to deteriorate flora of vulva and vagina.

Key Words: hyperbaric oxygen therapy, necrotizing fasciitis, abnormal uterine bleeding.

Necrotizing fasciitis (NF) is a rare, rapidly progressive soft-tissue infection that is characterized by extensive necrosis of subcutaneous tissue and other adjacent tissues, primarily involving the superficial fascia. Mortality rates for necrotizing soft-tissue infections (which include cellulites, fasciitis, and myositis) have varied between 6% and 76% [1]. However, NF that involves the vulva and perineum in women has generally been associated with a graver prognosis, when compared with the involvement of other anatomic sites [2].

Predisposing factors for these soft-tissue infections have included advanced age, obesity, hypertension and arteriosclerosis, diabetes mellitus, malnutrition, renal failure, immunosuppression, and trauma [3]. The bacteria that causes these infections was originally identified as hemolytic streptococci, but subsequent observations have implicated numerous other aerobic and anaerobic bacteria, which often act synergistically [4]. The importance of radiographic changes that are associated with gas production from NF was first demonstrated in 1979 [5] but this diagnostic modality did not play a significant role in the early diagnosis of NF in many studies.

It is generally believed that a continuous supply of oxygen to the necrotized tissue through the microcirculation is vital for healing and for protection against infection [6].

Hyperbaric oxygen therapy (HBO), is the application of oxygen in a high pressure circumstance. The hyperoxy and high pressure supplied in this chamber, has several useful clinic effects including also wound improving. HBO is an expansive treatment method when use frequently; for this

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reason it is more possible to be used in unusual situations. Such as in extremities, even in life threatening acute situations as a useful support treatment. In chronic situations, it can be useful when there couldn't taken any answer after a suitable local medical and surgical treatment. The pressure at sea level is 1 atmosphere pressure (ATA: Absolute atmosphere air). The pressure increases 1 ATA per each 33 ft depth. According to Boyle law the pressure and volume of an ideal gas is opposite rated. Oxygen is an essential component of wound healing, and the wound's ability to heal can be directly linked to the level of tissue oxygenation. Oxygen is used for protein synthesis, cell replication, hydroxylation of collagen, exportation of collagen out of the fibroblast cell, and neoeipithelialization. Hunt et al. [7] showed that the increase of oxygen pressure in wound forced the healing and increase the regression of infection. The effectiveness of wound repair is directly related to oxygen concentration. Angiogenesis at the edges of the wound site is driven by the existing oxygen gradient between the oxygen-poor area in the center of the wound and the oxygen-rich area at the periphery of the wound. The oxygen-poor, lactate-rich environment in the center promotes macrophages to produce angiogenesis factors until capillary ingrowth is complete, while the periphery of the wound supplies the oxygen necessary to support the angiogenesis process. Furthermore, the leukocyte's ability to kill bacteria is based in part on its ability to produce free radicals, which is oxygen gradientdependent. This gradient also affects the leukocyte's ability to clear bacteria from the wound site [8]. Based on experimental clinical observations, most of the national hyperbaric medicine societies have recommended the initiation of HBO therapy for wound healing and for minimizing the infectious process for the treatment of necrotizing soft tissue infection. But there are few reports on the use of HBO in the field of obstetrics. Here, we report our experience with HBO therapy to treat vulvar necrotizing fasciitis, a complication of using hygienic peds for abnormal uterine bleeding.

Case
Our patient was 38-year-old, nulliparous, not married and virgin. She came to our clinic suffering from abnormal uterine bleeding. She had a history of abnormal uterine bleeding which continued for 2 months and hadn't stopped. She hadn't any medical therapy until she came to our clinic. There was an endometrial stripe thickness in the abdominal ultrasonography and bilateral adnexes were normal. In vulvar inspection the patient had a mild ulcerative lesion which was specially placed at the right side of the vulva markable, including right labium majus and left labium minus and a little bit clitoral region (Figure 1). The white blood cell count was 12,500/mm³, the hemoglobin concentration was 8,6mg/dl, the hematocrite concentration was % 27, platelet count was 124000/mm3. Transvaginal ultrasonography was performed to visualize after we had the patients acceptance, and found that the endometrial stripe thickness was 14mm. She had full curetage to make endometrial sampling and treatment by general anesthesia. The result of the pathology was simplex endometrial hyperplasia without atipia. The menorrhagia symptom of the patient decreased after the curetage procedure and ended after she had gestagen threapy. Beside this the patient had to use contiuously hygienic peds cause of menorrhaiga for approximetely 2 months, as a result of this, the flora of the vulva and vagina spoiled and previously described ulcerative lesions had occured. The diagnosis of subcutaneous necrotizing fasciitis was made. The classic symptoms of NF were seen, such as local pain, smooth shiny skin and partial skin darkenings (Figure 2).
The culture which was taken from the lesion site was positive for Clostridium perfringes. The patient was hospitalized for one week and for another week she had her therapy at home. The therapy she held was daily wound debridement then povidone iyd, rifocin attachment, furacin pomad and ceftriaxone+metronidazole parenterally + oral, cause of the lesion had not been cured in 15 day time, she was referred to HBO therapy center.

The patient was treated in Undersea and Hyperbaric Therapy Center with HBO. The patient received HBO in 1 90-minute daily session of 100% oxygen breathing in a monoplace hyperbaric chamber (Ankara, Turkey) pressurized at 2.5 ATA (absolute atmosphere air), totally 25 sessions, first, 6 days a week then 5 days a week. The hyperbaric chamber was made in Turkey, was for single person and made of steel, had 6 lumbous and had a working pressure of 2 bars and test pressure of 5.5 bars. The chamber had been taken underpressure by breathing air and 100% oxygen was given with a mask. The HBO sessions were planned as two periods of oxygen inhalation for 40 minutes and between these periods 10 minutes of air breathing time. She was also given 1000 U vitamin E per day and 1 gram vitamin C per day during the treatment period as an antioxidant and free radical remover. After HBO therapy, the condition of the vulvar lesion improved dramatically. The patient's body temperature returned to normal on the 5th post-therapeutic day, and the edematous and erythematous appearance of the lesion site completely resolved on the last therapeutic day (Figure 3). The dark skin changes also had been cured at the 1-month follow up time. The 1-month follow-up of the vulvar lesion after completion of HBO therapy, revealed no adverse changes at the lesion site, and it had healed uneventfully.

Discussion

Necrotizing fasciitis is an uncommon soft-tissue infection, usually caused by toxin-producing, virulent bacteria, which is characterized by widespread fascial necrosis with relative sparing of skin and underlying muscle. It is often associated with severe systemic toxicity and is usually rapidly fatal unless promptly recognized and aggressively treated [9]. Necrotizing fasciitis primarily involves superficial fascia, subcutaneous fat (which contains vascular structures and nerves), and deep fascia. Myonecrosis (clostridial or nonclostridial) refers to a condition resulting in rapid necrosis of muscle, with delayed involvement of overlying skin and soft tissues [10].

There is no age or sex predilection for necrotizing fasciitis. The disease occurs more frequently in diabetics, alcoholics, immunosuppressed patients, i.v. drug users, and patients with peripheral vascular disease [11]. However, necrotizing fasciitis also occurs in young, previously healthy individuals [12].

Although it can occur in any region of the body, necrotizing fasciitis most commonly occurs in
the abdominal wall, extremities, and perineum [13]. The etiology of necrotizing fasciitis which occurs in genitourinary system are Bartholin’s gland duct abscess, cervical or pudendal nerve block, coital injury, genitourinary infections superimposed, postepisiotomy, septic abortion, vulvar abscess, discomfort of vulvar and vaginal flora. Introduction of the pathogen into the subcutaneous space can occur via any disruption of the overlying skin, such as a cut, abrasion, burn, laceration, contusion, bite, injection, or surgical incision.

The overwhelming majority of cases of necrotizing fasciitis of the vulva occur in obese diabetics and often begin as a Bartholin’s gland duct abscess or a vulvar abscess. Beside this a kind of NF which is defined by Fournier in 1883 named as Fournier gangrene, which attaches the scrotum and penis in man and the vulva and perineum in woman can also be seen [14]. Other etiologies include development of necrotizing fasciitis as a postoperative wound infection following cesarean section, episiotomy, hysterectomy, or minilaparotomy for bilateral partial salpingectomy [15]; in a previously irradiated area of the pelvis, often with a fatal outcome; after septic abortion; and following cervical or pudendal nerve block [16].

Necrotizing fasciitis usually begins with the development of characteristic skin changes within 7 days of the inciting event. An erythematous, tender, swollen, hot area of cellulitis, accompanied by local pain and fever, is commonly the first sign [17]. Early necrotizing fasciitis is very painful. Following the initial cellulitic skin changes, the skin becomes smooth, shiny, and tensely swollen as the erythema spreads diffusely. Induration or distinct margins are absent, with the diseased area gradually fading into normal skin. In a few days, the skin darkens to a patchy, dusky blue as bullae develop. Initially, the bullae are filled with serous fluid, which later becomes hemorrhagic [18]. Four or 5 days into the illness, the purplish skin becomes frankly gangrenous. In fact, the synergistic action of facultative aerobic and anaerobic bacteria could be responsible for the often fulminant course of the disease.

Diagnostic clues include severe local pain, fever, and signs of systemic toxicity with otherwise nonspecific history and physical examination findings. Treatment modalities include antibiotics, surgery, supportive care, and hyperbaric oxygen.

The feature of HBO that is believed to be responsible for its therapeutic efficacy is hyperoxia (elevated partial pressure of oxygen in tissues) [19]. The physiologic effects of HBO at the tissue level have been shown to include increased killing ability of leukocytes, killing of certain anaerobes, reduction of tissue edema, stimulation of fibroblast growth, and increased collagen formation [19]. Justification for its use is based on animal studies, case reports, and retrospective studies [20]. The Undersea and Hyperbaric Medical Society includes necrotizing soft-tissue infection as one of only 12 reimbursable indications for the use of HBO [21].

HBO is an expansive treatment modality which provides success at suitable conditions. For this reason, first of all the real underlying cause should be treated than the situations like arterial narrowing, anemia, malnutrition and venous stasis. Only a chronic wound isn’t certainly sufficient to be an indication for HBO. The contraindications should be considered before the decision for HBO treatment was made. The oxygen pressure inside the skin around the wound and the blood flow should be appraise by doppler. The oxygen pressure inside the skin can be measured by an electrode, non invasively. HBO therapy shouldn't be considered for all the chronic wound and infections before these tests are applied.

In this case we report that, all the tests needed were made, and also all possible medical and probably local surgical treatment were made but the success have been taken after the HBO therapy. As following we search for previously made studies.

In a retrospective analysis, Riseman and colleagues [22] reported on 29 patients with necrotizing fasciitis, 12 of whom received conventional surgical and antibiotic therapy and 17 of whom received adjunctive HBO. HBO consisted of 90 min in a monoplace chamber at 2.5 atm every 8 h the first day, then twice daily for a total of 10 treatments. All HBO-treated patients received their first treatment within 24 h of hospital admission. Patient demographics, wound bacteri-
ology, and antibiotic therapy were similar between the groups. The HBO group contained more diabetics (47% vs 33%), more patients in shock (29% vs 8%), and more patients with perineal or truncal infections (71% vs 50%). Mortality was 66% in the non-HBO group vs 23% in the HBO group (p<0.025), and the HBO group required an average of 1.16 debridements whereas the non-HBO group required 3.25 (p<0.03). This study has been criticized because the groups were treated successively, with all non-HBO group patients being treated prior to the acquisition of the chamber (before 1980). The authors themselves state that as the study progressed, clinicians prescribed earlier and more extensive debridements. Hence, the HBO group may simply have benefited from the more efficacious therapy of early and extensive debridement.

In another study, Brown et al performed a retrospective review of the efficacy of HBO [23]. They looked only at truncal necrotizing infections and identified 30 patients treated with HBO and 24 patients who did not receive HBO. HBO consisted of 90-min treatments with 2.5 to 3.0 atm. Eighty percent of the HBO-treated patients received less than five treatments and the remainder received between five and seven, with discontinuation once patients' conditions stabilized and there was no evidence for ongoing necrosis. The HBO-treated group was younger (51 vs 62 years), had more clostridial infections (50% vs 17%), had longer ICU stays (7.3 vs 3.5 days; NS), and underwent more operations (mean of 3.2 vs 1.7; p<0.002) and more debridements (mean of 2.4 vs 1.3; p<0.004) than the non-HBO group. Laparotomy was performed in 20 (66%) of the HBO group vs 10 (41%) of the non-HBO group (p<0.007). Hence, the HBO group was sicker and was treated more aggressively than the non-HBO group. This suggests that HBO was reserved for the sickest patients and/or that it actually improved patient outcome. There was a trend toward better survival in the HBO-treated group (30% vs 42% mortality), but because of the small study size, it did not reach statistical significance.

As above explained there are several cases in which HBO is used, but as we explained before in this case we aimed to show that HBO can be used in different patterns of gynecology. Abnormal uterine bleeding is a cause of deflation of vulva and vagina especially hygienic ped usage. This causes the formation of necrotizing fasciitis placed in vulva. The obstetrics and gynecology is a different file to search for HBO therapy.

References