

【Case Report】

Successful Hyperbaric Oxygenation in a Patient with Priapism

Teruhiro Nakada¹⁾, Hiroko Nakada²⁾, Yasuyuki Yoshida³⁾, Koichi Matsumoto¹⁾, Yasuyo Nakashima¹⁾, Yoko Kubota⁴⁾, Satoru Anbiru⁵⁾ and Haruo Ito⁶⁾

1) Department of Urology, Yotsukaido Tokushukai Hospital, Yotsukaido City, Chiba, Japan

2) Doai Kinen Hospital, Tokyo, Japan

3) Chiba Tokushukai Hospital, Narashino, Japan

4) Yamagata Prefectural Okitama Hospital, Okitama, Japan

5) Chiba Prefectural Oami Hospital, Oami, Japan

6) Chiba University, School of Medicine, Chiba, Japan

ABSTRACT

In recent years, limited progress has been made in the treatment of low-flow (ischemic) priapism. Although hyperbaric oxygen therapy has been known to produce beneficial effects in some ischemic tissue injuries, the application of HBO to this harmful disease has not been reported. A 21-year-old Japanese man with low-flow priapism lasting 23 hours was referred to our clinic. Traditional treatments, such as detumescence by repeated intracavernous aspiration and subsequent corporeal irrigation had been attempted but were unsuccessful. He was then treated daily with hyperbaric oxygen at 2 atmospheres (absolute) pressure for 90 minutes for seven consecutive days. This therapy was successful in terminating the priapism. Neither erectile dysfunction nor overt evidence of the priapism has been subsequently observed.

keywords

Corporeal hypoxia, erection, successful detumescence

INTRODUCTION

Priapism is categorized into low-flow (ischemic), when there is no arterial flux into the penis, or high-flow (non-ischemic), when there is enhanced arterial inflow. The most prevalent form is low-flow priapism, which is characterized by long periods of stagnant ischemia¹⁾. In this situation, the corporeal blood becomes hypoxic and acidic. If detumescence is not achieved, prolonged priapism induces erectile dysfunction²⁾. There has been very limited progress in the treatment of this painful and harmful disease. We successfully treated a patient with low-flow priapism with hyperbaric oxygen (HBO) therapy.

CASE REPORT

A 21-year-old Japanese student was referred to our

clinic complaining of persistent erection unrelated to sexual stimulation (Fig.1A). The duration of priapism at presentation was 23 hours. Recognized causes such as sickle cell disease, infiltrative neoplasms, trauma, hematological abnormalities, neurologic lesions and abuse of psychotropic agents were excluded. Low-flow, ischemic or anoxic priapism appeared to be the most likely in this patient since high-flow, well-oxygenated priapism has been generally associated with the injury of penile or perineal cavernous arteries. In addition, the ischemic nature of low-flow priapism was confirmed by the intracorporeal blood gas appearance and Doppler analysis (Fig. 1B). The analysis of corporeal blood aspirate revealed a pH of 6.7, a pO₂ of 20 mg and a pCO₂ were 86 mmHg. The aspiration of cavernous blood through a 19-gauge needle relieved

pain slightly, but failed to reduce priapism. After informed consent had been obtained from the patient, he received HBO treatment of 100% oxygen in a mono-place hyperbaric oxygen chamber (BARA MED, Environmental Tectonics Co., PA, USA). The HBO therapy consisted of 90 minutes at 2 atmospheres (absolute) pressure daily for seven consecutive days. A notable reaction was obtained by the second HBO treatment. Successful detumescence was substantially achieved and his penis returned to a normal state (Figs. 2A, 2B). Four years after this treatment, the patient can enjoy sexual activity without subsequent erectile dysfunction.

DISCUSSION

Priapism, especially associated with a low-flow state, should be treated promptly. Disturbance of corporeal drainage leads to local hypoxia, and occasionally produces acidosis and ischemia^{1, 2)}. Indeed, hypoxia and acidosis were prominent in our patient. Ischemia was also suggested by the dark color of the aspirated blood from the corpora and by the ultrasound scan

(Fig.1B). HBO treatment consisting of daily inhalation of 100% oxygen at a pressure of 2 atmospheres (absolute) for some set period of time has been generally known to produce beneficial effects in ischemic, necrotic or radiation-induced tissue injuries by fibroblast proliferation, enhancement of fibroblastic synthesis of collagen and capillary formation^{3, 4)}. It is also usually assumed that HBO treatment exerts a favorable effect in the execution of bacteria³⁾. At present, however, the prompt effect of HBO on increased synthesis of vascular protein appears to be less likely by the fact that HBO did not accelerate the vascular or fibrous development in a very short period^{3, 4)}. It is assumed that tissue oxygen tension probably plays an important role in ischemia-healing procedure. Tissue oxygen tension of at least 30 to 40 mmHg appears to be indispensable for this process⁴⁾. We did not measure the penile tissue oxygen tension in this patient after the successful treatment with HBO. However, other experiments following identical HBO treatment indicate that the local tissue oxygen tension reaches a sufficient level⁵⁾.

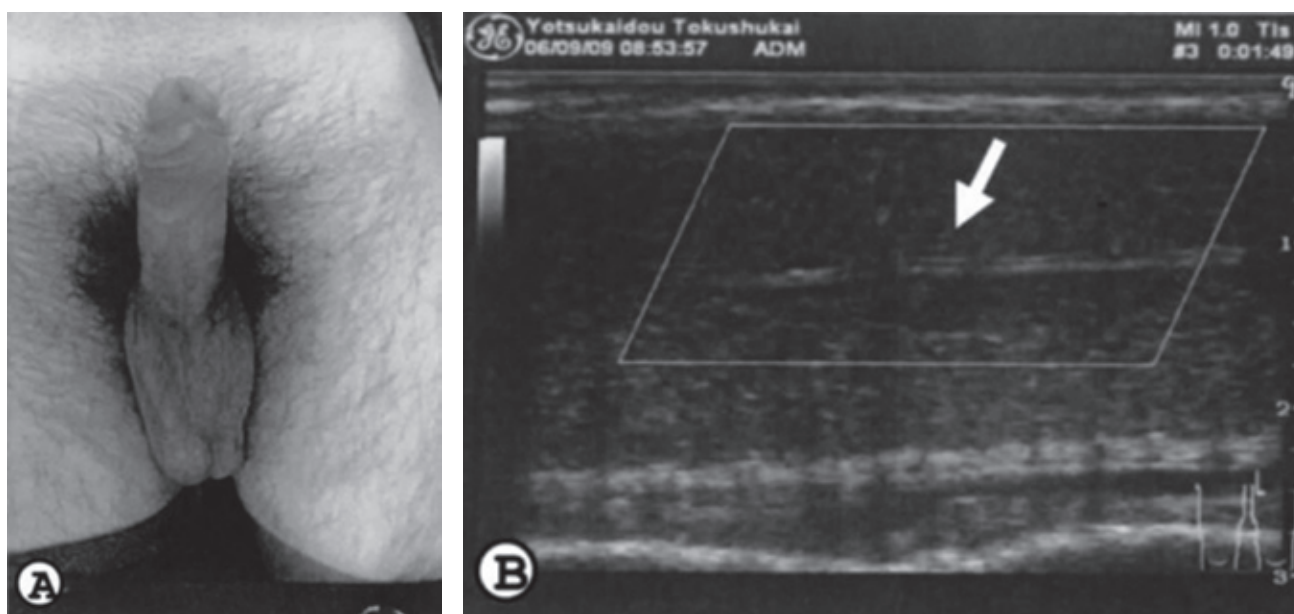


Fig. 1 The erect penis before the HBO treatment (A). The vascular looseness probably increases the inflow of blood into the corporeal bodies. The venous drainage becomes retarded by compression of the venules between expanding sinusoids. The emissary veins become contracted (B).

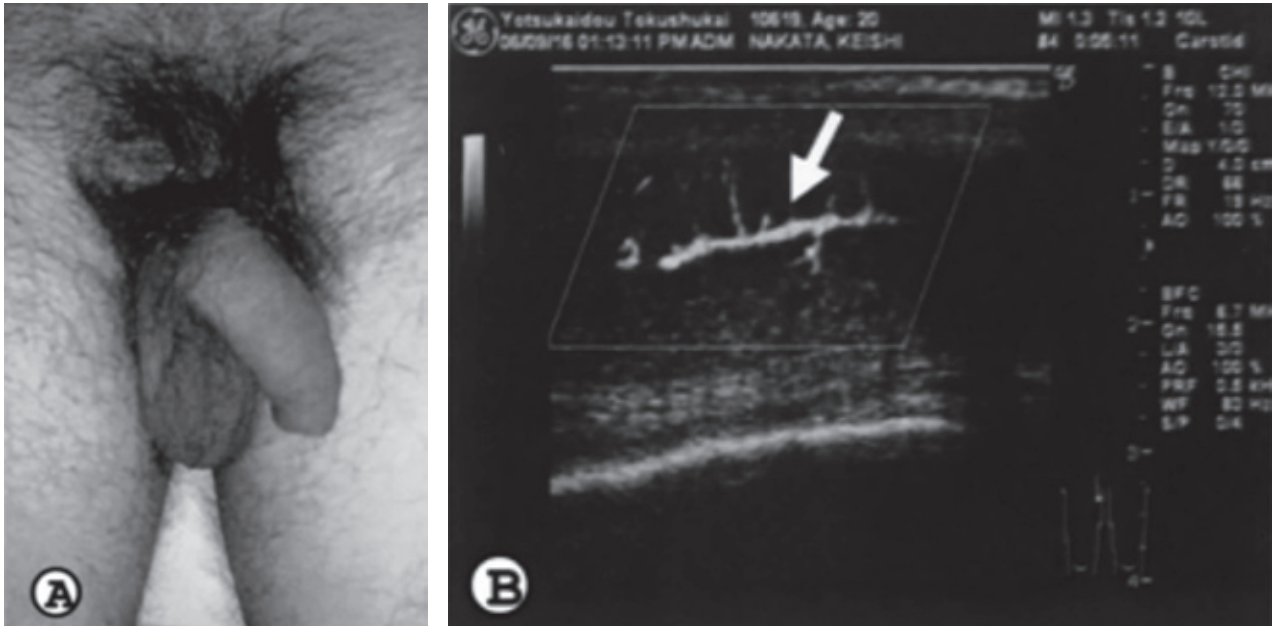


Fig.2 The penis in a flaccid condition 7 days after the HBO treatment (A). The corpora cavernosa is probably reduced. This leads to increased venous drainage of the corpora to the emissary veins (B).

A question may be raised to the prolonged efficacy of the HBO therapy. We assayed tissue oxygen tension only once in this patient, but it is generally accepted that oxygen levels provided by similar HBO treatments have produced sufficient oxygen tension which is indispensable for angiogenesis⁵⁾. In the process of detumescence, there is a reversion of the intrinsic sympathetic tone to the corpora cavernosa. The contraction of penile blood vessels and trabecular smooth muscle is considered to be moderated by the sympathetic adrenergic nerves through alpha-adrenoceptors¹⁾. Possible stimulation of these receptors by the HBO treatment might reduce the inflow of blood to the corpora cavernosa and expedites venous drainage, resulting in a reversion to the flaccid condition. Unsuccessful detumescence in prolonged low-flow ischemia frequently induces irreversible erectile dysfunction^{1, 2, 6)}.

It is essential to decompress the corpora as soon as low-flow priapism has been confirmed. The accepted treatment selections for priapism comprise penile aspiration, irrigation, instillation of vasoactive agents, shunting procedures and insertion of a penile

prosthesis^{1, 2, 6, 7, 8, 9)}. However, there have been no definitive advances in the management of this harmful disease. We successfully treated a patient with low-flow priapism with hyperbaric oxygenation. In preparing this case report, the authors failed to find any previous reports to treat this disease by HBO. We advocate further clinical and laboratory study to confirm the advantages of HBO treatment for priapism.

ACKNOWLEDGMENT

We are grateful to the patient who agreed to this treatment.

REFERENCES

- 1) Weiner DM, Lowe FC: Psychotropic drug-induced priapism. *CNS Drugs* 1998 ; 9 : 371-379.
- 2) Muneer A, Cellek S, Dogan A, et al: Investigation of cavernosal smooth muscle dysfunction in low flow priapism using an in vitro model. *Int J Impot Res* 2005 ; 17 : 10-18.
- 3) Marx RE, Ehler WJ, Tayapongsak P, Pierce LW: Relationship of oxygen dose to angiogenesis induction in irradiated tissue. *Am J Surg.* 1990 ; 160 : 519-524.
- 4) Nakada T, Saito Y, Chikenji M, et al: Therapeutic

- outcome of hyperbaric oxygen and basic fibroblast growth factor on intractable skin ulcer in legs : preliminary report. *Plast Reconstr Surg* 2006; 117 : 646-651.
- 5) Nakada T: Hyperbaric oxygenation of experimental bladder tumor: I. Tissue oxygen tension for the rabbit bladder during hyperbaric oxygenation. *Eur Urol* 1988 ; 14 : 145-149.
- 6) Rees RW, Kalsi J, Minhas S, et al: The management of low-flow priapism with the immediate insertion of a penile prosthesis. *BJU Int* 2002 ; 90 : 893-897.
- 7) Burnett AL, Bivalacqua TJ, Champion HC, Musicki B: Feasibility of the use of phosphodiesterase type 5 inhibitors in a pharmacologic prevention program for recurrent priapism. *J Sex Med* 2006 ; 3 : 1077-1084.
- 8) Lue TF, Hellstrom WJ, McAninch JW, Tanagho EA: Priapism: a refined approach to diagnosis and treatment. *J Urol* 1986 ; 136 : 104-108.
- 9) Pryor JP, Hehir M: The management of priapism. *Br J Urol* 1982 ; 54 : 751-754.