J Pediatr Urol

. 2020 Apr;16(2):163.e1-163.e7.

doi: 10.1016/j.jpurol.2020.01.002. Epub 2020 Jan 14.

Hyperbaric oxygen therapy for pediatric "hypospadias cripple"–evaluating the advantages regarding graft take

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- PMID: 32171667

- DOI: 10.1016/j.jpurol.2020.01.002

Abstract

Introduction: Hypospadias cripple patients pose a major surgical challenge with high complication rates attributed mainly to graft contraction. Hyperbaric oxygen therapy (HBOT) is an established treatment for compromised grafts and used extensively as a salvage therapy for compromised grafts and ischemic non-healing wounds.

Objective: We evaluated the graft-take rates in hypospadias cripple cases undergoing a staged tubularized autograft repair (STAG) and compared between patients treated with or without preemptive HBOT.

Materials and methods: All patients underwent a STAG. Patients receiving preemptive HBOT were compared with patients receiving the standard surgical procedure without HBOT. The HBOT protocol included a daily session, 5 days per week for four weeks before the surgery and 10 additional daily sessions immediately after first-stage surgery.

Each HBOT session included 90 min exposure to 100% O_2 at 2 atmospheres absolute with 5 min air breaks every 20 min. The primary endpoint was graft take. Sequential tubularization without tension at second stage was defined as success.

Results: Seven boys received HBOT and 14 boys comprised the control group. All patients in the HBOT group had good graft take with no graft contraction. In the control group, 57% had good graft take and could proceed to the second-stage surgery and 43% had graft contraction (Table). Except for one patient who had claustrophobia while entering the chamber, no significant side-effects developed during the HBOT.

Discussion: The basic pathophysiology of compromised flaps includes both ischemia and reperfusion injury, which can be attenuated by HBOT. The beneficial effects of HBOT relates to several mechanisms, including hyperoxygenation, fibroblast proliferation, collagen deposition, angiogenesis, and vasculogenesis. Graft contraction is a well-known complication in hypospadias cripple population with reported failure rate of 39-63%. The HBOT procedure was found to be very effective and the entire HBOT group had a good graft take. Accordingly, all patients in the HBOT group proceeded to a successful second-stage tubularization. In addition, HBOT was found to be safe and generally well tolerated by this pediatric population. Study limitations were a relative small, non-homogenous sample size and lack of prospective randomization. Success was defined as sufficient graft elasticity sufficing for tubularization of the neourethra, and exact graft measurements are lacking in this study.

Conclusions: Preemptive HBOT can be used safely in the hypospadias cripple pediatric population and can potentially reduce the expected high surgical failure secondary to graft contraction.

Keywords: Hyperbaric oxygen; Hypospadias.