

observations, together, will encourage others to use HBO therapy in the management of this challenging clinical condition. Patients with tracheal repair who need tracheostomy, however, require special attention under HBO therapy. Some of the pertinent issues are discussed in the next paragraphs.

HBO therapy is the administration of ~100% oxygen at higher atmospheric pressures in a pressurized vessel, the so-called hyperbaric chamber. There are 2 types of hyperbaric chambers: monoplace and multiplace. The former accommodates only 1 patient and is pressurized with oxygen; hence, the patient breathes oxygen directly from the surroundings. The latter accommodates multiple patients at the same time and is pressurized with air; therefore, patients breathe oxygen by way of a facemask, hood, or endotracheal tube.

Patients with tracheostomy experience increased respiratory distress inside the chamber owing to the increased density of the respired gases and the narrowing of their airway lumen by the tracheostomy.³ Because patients with tracheostomy cannot breathe through a facemask, 2 other options remain to deliver oxygen to patients treated in a multiplace chamber. The first option is to use a hood; however, most of the hoods will not be suitable for these patients because the neck seal of the hood corresponds to the tracheostomy opening. The second option is to attach a T-tube to the tracheostomy, which separately provides inspiration and expiration from the 2 limbs. However, this technique dramatically increases the respiratory resistance and makes breathing extremely hard for the patient.⁴ Therefore, monoplace chambers, which are compressed with oxygen and in which the patients breathe directly from the surroundings without the need for accessories, will be more suitable and comfortable for these patients.

Another important aspect of treating a patient with an artificial airway is the challenge of equalization of the middle ear pressure with the ambient pressure during the compression phase of HBO treatment. Failure to do so can lead to middle ear barotrauma, which is the most frequent side effect of HBO therapy.⁵ Patients with tracheostomy might require myringotomy or tympanostomy tube placement to avoid middle ear barotrauma, because they will not be able to efficiently auto-inflate their middle ear compartment.⁵

Finally, the tracheostomy tube cuff in patients undergoing HBO treatment should, preferably, be inflated with water rather than air. Air-filled cuffs will shrink at high pressure and cause the tracheostomy tube to be displaced.

We hope that the preventive measures we have noted will help to avoid HBO-related complications in patients with tracheostomy.

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References

1. Stock C, Gukasyan N, Muniappan A, Wright C, Mathisen D. Hyperbaric oxygen therapy for the treatment of anastomotic complications after tracheal resection and reconstruction. *J Thorac Cardiovasc Surg.* 2014;147:1030-5.
2. Gorur R, Hahoglu A, Uzun G, Kutlu A, Turut H, Yiyit N, et al. Effects of hyperbaric oxygen therapy on wound healing after tracheal resection and end-to-end anastomoses in rats: results of early observations. *Thorac Cardiovasc Surg.* 2008;56:359-62.
3. Sieker HO, Saltzman HA. Medical considerations and applications of hyperbaric oxygenation. *JAMA.* 1965;193:31-6.
4. Prather ID, Wilson JR. An alternative oxygen supply technique for the difficult patient. *Undersea Hyperb Med.* 1995;22:183-4.
5. Presswood G, Zamboni WA, Stephenson LL, Santos PM. Effect of artificial airway on ear complications from hyperbaric oxygen. *Laryngoscope.* 1994;104:1383-4.

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Reply to the Editor:

Hyperbaric oxygen therapy (HBOT) is a promising therapy for the treatment of airway complications after tracheal surgery. In their letter to the Editor, Uzun and Mutluoglu describe its application specifically in patients who have a tracheostomy. Although we have not had any patients with tracheostomies requiring HBOT, we believe that anything to improve the safety and lessen the risk of complications of HBOT is a valuable contribution to the literature. Continued investigation into the benefits of HBOT for the treatment of airway complications after tracheal surgery is needed.

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FACTORS TO BE CONSIDERED IN AORTIC REPAIR To the Editor:

We read the article by Schäfers and colleagues¹ with great interest. Because successful aortic valve repair aims at restoration of cusp and root dimensions, normal values of human cusps should be documented. The authors demonstrated that cusp height displays marked variability and is correlated with clinical variables. Furthermore, a positive correlation was observed between geometric cusp height and body height, the type of fusion (partial or complete) did not seem to have an effect on size of the cusp, and repair procedures may not provide a sufficient valvular stability for retracted valves.² They also note that cusp height was larger than in previously published reports and suggest that their data could serve as a basis for decision making in aortic valve repair.

Prolapse and retraction of cusps and annular dilation are structural

parameters that may influence the aortic repair procedure. However, we think that there may not be a causal relationship between geometric height of cusps and correlated parameters as shown in Table 1 in the article.¹ A bicuspid aorta does not thoroughly comply with the fluid mechanics and tricuspid valves are superior in the aortic position.³ In addition, the measurement shown in Figure 2 in the article may not be accurate because the diameter of the aorta increases 10% in systole relative to diastole and tricuspid aortic leaflets are prone to being influenced by this change. Bicuspid aortic leaflets resist such pressure alterations due to their position, and therefore bicuspid aortic leaflets undergo trauma during systole. Tricuspid aortic leaflets get closer to the aortic wall during systole than do bicuspid valves and this results in a more obvious exposure of

bicuspid aortic leaflets against friction and shear stress.³ We believe restoration of the aortic valve as a tricuspid structure is necessary.

Aortic cusp structure distorted due to aortic regurgitation may not be corrected with plication alone. The texture and strength of cusps must be additionally supported. Shape, fusion, and direction of flow may affect all measurements of cusps. Beyond that, cusps can extend and become retracted due to fluctuations resulting from vibrations of flow. We suggest that lack of correlation between surgical technique and height of the cusp is another limitation of the aforementioned study.

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References

1. Schäfers HJ, Schmied W, Marom G, Aicher D. Cusp height in aortic valves. *J Thorac Cardiovasc Surg.* 2013;146:269-74.
2. Le Polain de Waroux JB, Pouleur AC, Robert A, Pasquet A, Gerber BL, Noirhomme P, et al. Mechanisms of recurrent aortic regurgitation after aortic valve repair: predictive value of intraoperative transesophageal echocardiography. *JACC Cardiovasc Imag.* 2009;2:931-9.
3. Cakir H, Kestelli M, Yurekli I, Donmez K. The effects of bicuspid aorta. *J Thorac Cardiovasc Surg.* 2014;147:1439-40.

<http://dx.doi.org/10.1016/j.jtcvs.2014.10.016>