

## Transtacheal Oxygen: Not Exactly a "Novel" Technology

I was recently catching up on some long overdue journal reading and came upon the editorial "Demand valves for oxygen therapy: your mileage may vary" by John Shigeoka in the February issue of *RESPIRATORY CARE*.<sup>1</sup> Though I agree with the overwhelming majority of Dr Shigeoka's observations, I took exception to his description of transtacheal catheters as "the other novel form of oxygen-conserving device."

Dr Shigeoka observed that he rarely sees ambulatory patients using transtacheal catheters. That may certainly be the case in the Salt Lake City area in general, and at his Veterans Affairs hospital specifically, but it is certainly not the case nationwide.

There are tens of thousands of transtacheal oxygen patients across the United States, and indeed around the world. After all, chronic obstructive pulmonary disease (the most common indication for transtacheal oxygen) doesn't know where the patient lives. Transtacheal oxygen has been available since Heimlich first published an article on the subject in 1982.<sup>2</sup> Subsequent work by Christopher et al,<sup>3</sup> Hoffman et al,<sup>4</sup> and Kampelmacher et al<sup>5</sup> have proven both the safety and efficacy of transtacheal oxygen, as well as a variety of other clinical improvements, such as in the patient's work of breathing,<sup>6</sup> compliance with prescribed oxygen therapy,<sup>3</sup> hospitalizations,<sup>4</sup> and overall quality of life.<sup>4</sup> The transtacheal oxygen program originally outlined by Christopher et al<sup>3</sup> has been dramatically streamlined over the past 18 years, and the newer "Fast Tract" procedure, done by a qualified surgeon, has also decreased the very labor-intensive early phases of the old Seldinger technique from 6–8 weeks to just 2–3 weeks. Many of our patients combine their transtacheal oxygen with pulse or demand-valve oxygen delivery systems, which substantially enhances their ability to get out of the house and increase the duration and quality of their activities of daily living.<sup>7</sup>

It is easy to overlook the fact that the transtacheal catheter itself is a conserving device, in that it normally decreases resting oxygen flow by approximately 50%. Using conservative estimates with a demand-valve

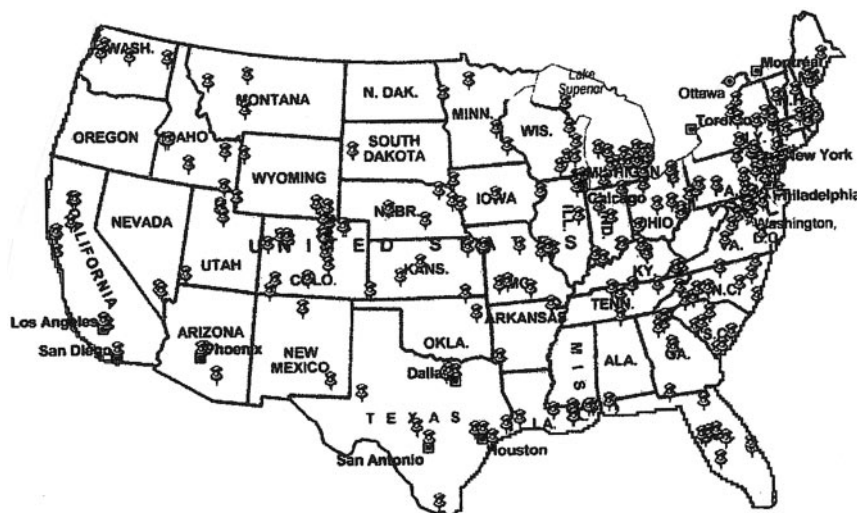


Fig. 1. Transtacheal oxygen centers in the United States (there is also one in Alaska, not shown). Each push-pin symbol indicates a transtacheal oxygen center.

device, with just a 2–1 oxygen savings, that would result in a bulk oxygen reduction of some 75%. Several studies have also documented significant decreases in hospital days and costs per admission, which saves money for all of us, including those who pay for this patient care through our taxes.<sup>4,8</sup>

In fact, there has recently been very substantial renewed interest in transtacheal oxygen, as reports on some of the more advanced applications (eg, in augmented ventilation,<sup>9</sup> in patients who are noncompliant with continuous positive airway pressure in the treatment of obstructive sleep apnea,<sup>10,11</sup> and as an aid to weaning long-term-tracheostomized patients from mechanical ventilation) begin to be published in respected journals.<sup>12</sup>

I have included a "stick pin" map of the United States showing active transtacheal oxygen centers (Fig. 1). As you can see, transtacheal oxygen centers tend to cluster around major population centers, but that is not always the case. Interestingly, there are active transtacheal oxygen centers in every state except Oregon. There are also transtacheal oxygen patients in 9 European countries, Australia, and New Zealand. Respiratory therapists play important roles in the administration and clinical evaluation of transtacheal oxygen patients in hospital-based

programs. For all intents and purposes, a transtacheal oxygen program is a ready-made therapist-driven protocol just waiting to be implemented.

Though it is true that transtacheal oxygen may not be prevalent in certain areas where many therapists and pulmonologists practice, with an 18-year of history of clinical practice and over 150 references in the medical literature, transtacheal oxygen is surely a therapy that is underutilized and could benefit many thousands of patients with chronic obstructive pulmonary disease who require continuous supplemental oxygen.

As always, future studies need to be done to corroborate much of this speculation and extrapolation of existing and anecdotal data. Last year a graduate of the pulmonary fellowship program at Harvard told me that in his 3 years of training he only had 1 hour covering oxygen therapy. Perhaps it is time to make sure these young pulmonologists, while still residents and fellows, are trained to think of oxygen as a drug we put "in" a patient, rather than "on" a patient.

**John R Goodman RRT**

Technical and Professional Services  
Transtacheal Systems Inc  
Englewood, Colorado

## REFERENCES

1. Shigeoka J. Demand valves for oxygen therapy: your mileage may vary (editorial). *Respir Care* 2004;49(2):156–157.
2. Heimlich HJ. Respiratory rehabilitation with transtracheal oxygen system. *Ann Otol Rhino Laryngol* 1982;91(6 Pt 1):643–647.
3. Christopher KL, Spofford BT, Petrun MD, McCarty DC, Goodman JR, Petty TL. A program for transtracheal oxygen delivery: assessment of safety and efficacy. *Ann Intern Med* 1987;107(6):802–808.
4. Hoffman LA, Wesmiller SW, Sciurba FC, Johnson JT, Ferson PF, Zullo TG, Dauber JH. Nasal cannula and transtracheal oxygen delivery: a comparison of patient response after 6 months of each technique. *Am Rev Respir Dis* 1992;145(4 Pt 1):827–831.
5. Kampelmacher MJ, Deenstra M, van Kesteren RG, Melissant CF, Douze JM, Lammers JWW. Transtracheal oxygen therapy: an effective and safe alternative to nasal oxygen administration. *Eur Resp J* 1997;10(4):828–833.
6. Benditt J, Pollock M, Roa J, Celli B. Transtracheal delivery of gas decreases the oxygen cost of breathing. *Am Rev Respir Dis* 1993;147(5):1207–1210.
7. Yaeger ES, Goodman S, Hoddes E, Christopher KL. Oxygen therapy using pulse and continuous flow with a transtracheal catheter and a nasal cannula. *Chest* 1994;106(3):854–860.
8. Bloom BS, Daniel JM, Wiseman M, Knorr RS, Cebul R, Kissick WL. Transtracheal oxygen delivery and patients with chronic obstructive pulmonary disease. *Respir Med* 1989;83(4):281–288.
9. Christopher KL, VanHooser DT, Jorgenson SJ, Winslett L, Diehl SS, Young DA, et al. Preliminary observations of transtracheal augmented ventilation for chronic severe respiratory disease. *Respir Care* 2001;46(1):15–25.
10. Farney RJ, Walker JM, Elmer JC, Viscomi VA, Ord RJ. Transtracheal oxygen, nasal CPAP and nasal oxygen in five patients with obstructive sleep apnea. *Chest* 1992;101(5):1228–1235.
11. Schneider H, O'Hearn DJ, Leblanc K, Smith PL, O'Donnell CP, Eisele DW, et al. High-flow transtracheal insufflation treats obstructive sleep apnea: a pilot study. *Am J Respir Crit Care Med* 2000;161(6):1869–1876.
12. Christopher KL, Yaeger ES, Shapiro H, Hamel UA, Petty TL. Comparison of transtracheal augmented ventilation to conventional methods of liberation from prolonged long-term ventilation (abstract). *Chest* 2002;122:156S.

*The author responds:*

I would like to thank Mr Goodman for informing the readers of *RESPIRATORY CARE* and me about the success of the transtracheal oxygen catheter, which was considered a decade ago, along with the reservoir

cannula and demand oxygen valve, to be a novel way to deliver oxygen.<sup>1</sup> The *fourth* novel strategy was *combined* demand-flow and transtracheal therapy.<sup>1</sup> However, the study by Bliss et al<sup>2</sup> concerned demand valves that delivered oxygen to the *nasal* airway (see the Methods section). That study was the focus of my editorial.<sup>3</sup>

My sightings of the transtracheal catheter are rare. This may be supported by Mr Goodman's map that shows his company has much less market penetration in Utah than in Colorado.

**John W Shigeoka MD**

Pulmonary Section  
Veterans Affairs Medical Center  
Salt Lake City, Utah

## REFERENCES

1. Hoffman LA. Novel strategies for delivering oxygen: reservoir cannula, demand flow, and transtracheal oxygen administration. *Respir Care* 1994;39(4):363–377.
2. Bliss PL, McCoy RW, Adams AB. Characteristics of demand oxygen delivery systems: maximum output and setting recommendations. *Respir Care* 2004;49(2):160–165.
3. Shigeoka JW. Demand valves for oxygen therapy: your mileage may vary. *Respir Care* 2004;49(2):156–157.