

Comparing Belt and Classical Techniques Using MRI and Video-Fluoroscopy



Lisa S. Popeil

In the field of voice research, few topics elicit as much controversy and interest as the investigation of “belting.” Though belting is, historically, the dominant form of sung vocal expression (from the first yells of cavemen to the musical theater singers of today), the ascent of the European Bel Canto tradition has brought into question the artistic validity, healthfulness, and even aesthetic value of this powerful use of the voice.

This article is based on a presentation given at the Voice Foundation’s 1999 “Care for the Professional Voice” Symposium in Philadelphia, PA, and compares belt and classical vocal techniques using three modalities: magnetic resonance imaging (MRI), video-fluoroscopy, and video-laryngoscopy, on one subject. The scientific team was composed of

myself as the singer-subject, Dr. Dee Parker, speech pathologist, and Dr. Christopher Lombardo, laryngologist, both of the Center for Voice in Santa Ana, CA, and Dr. Joseph Bruggman of West Coast Radiology Lab.

The goal of the research was two-fold: first, to see how useful MRI and video-fluoroscopy might be as an adjunct to traditional endoscopy in comparing classical and belting vocal techniques. Second, I was interested in validating, by observation, a subjective sensation that is the hallmark of my approach to belting, which I employ daily with my students with much success. I was most interested in gaining evidence concerning the relationship of the thyroid and cricoid cartilages and how they might tilt or angle in classical versus belting. Previous research (Estill 1988) has suggested that the cricoid cartilage tilts upward with the thyroid cartilage held stable for belting, and others anecdotally have mentioned to me that the thyroid cartilage may tilt down and forward for belting. In several of my students trained in both vocal techniques, I have actually manually felt thyroid and cricoid cartilages tilting toward each other for belting. There may also possibly be thyroid cartilage movement forward laterally. In the end, there may be much individual variation.

As mentioned before, there continues to exist in the voice community a long-standing bias against belt-

ing, particularly and surprisingly in America. Fortunately, things are changing. Typical questions posed by voice teachers include “Is there a way to belt safely, beautifully, but authentically? Will belting cause vocal ruin, what are the differences between good and bad belting, how do I go about learning to belt, how can I teach my students to belt, and what is belting anyway?” I set out on this quest for clarity about twenty years ago and since then have been codifying an approach to the performance and pedagogy of all American vocal styles.

It might be helpful at this point to share a working definition of the terms “belt” and “belting” as I use them, since the usual, on-the-street definition implies that belting means singing extremely loudly and “bringing the house down.” I use the word belt to describe a specific style used in musical theater that is speechlike or yell-like in character and which uses a sensation I call “laryngeal lean,” a sensation of laryngeal cartilage leaning forward against the skin of the neck as the pitch goes up. (This sensation can also be felt as the vocal cords being stretched from the front.) Though there’s no consensus on terminology, I use belting as a general term meaning the use of the speechlike or yell-like sound in any number of vocal styles including, but not limited to, rock, jazz, country, and R&B. Simply put, belt is its own

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style used in musical theater which uses belting. Belting does not have to necessarily be loud; soft belting is an option but includes the definite sensation of “the lean.” In classical production the larynx feels like it moves more deeply into the neck on the ascent of pitch and there is a vivid sense of head resonance on higher notes, unlike in belting, where there is no sensation of head resonance.

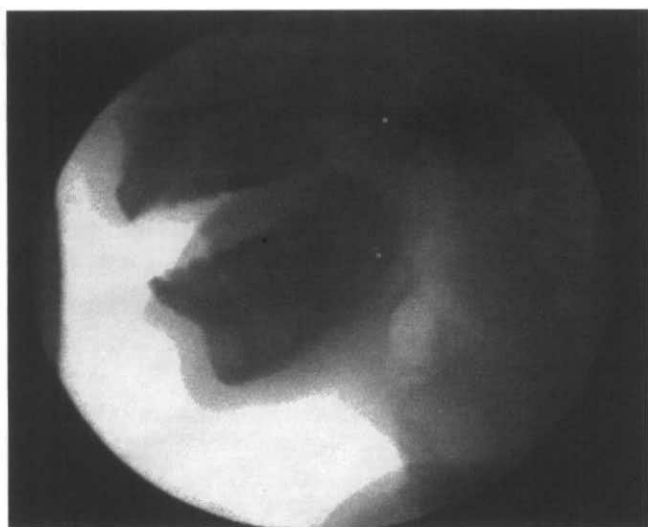
This research was inspired by my desire to see if angling between the thyroid cartilage and cricoid cartilage was visible and quantifiable using the various modalities of MRI, video-fluoroscopy, and endoscopy. This study used the vowel “aa” on various pitches, followed by an excerpt of the song “Everything’s Coming Up Roses” from the musical *Gypsy*, comparing the two different vocal approaches. We used real time video-fluoroscopy in frontal and side views. MRI was performed on a 1.5 Tesla magnet with SPGR and T1 sagittal images.

In the side view of classical, the laryngeal cartilage is quite low, and

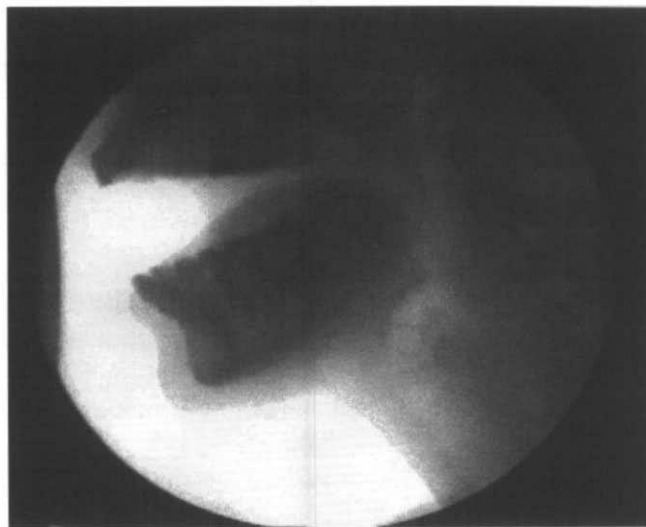
there is quite a bit of spaciousness between the back of the tongue and rear pharyngeal wall. In belting, side view, the larynx is higher by approximately one to one and a half cervical vertebrae at the same pitch, there’s more posterior tongue carriage, the soft palate is held slightly lower, and there’s a narrowing of space between the back of the tongue and rear pharyngeal wall. There’s a noticeable difference in spinal angling as well. In classical, the slightly more tipped down head position results in a straighter, more vertical cervical line, which increases the wideness of the pharynx.

In the front view of the video-fluoroscopy samples, the true and false vocal folds with the ventricle in between are clearly visible and except for the increase in laryngeal height for belting, in the frontal view the contour and apposition of the vocal folds look remarkably similar in both techniques. There is no pressing of true or false folds. In fact, in belting, the true folds are “barely touching, barely apart,” a positive sign for healthy vocal technique.

In the side view of belting, the posterior movement of the tongue flattens the epiglottis and reduces the dimension of the vallecula, the space between the bottom of the tongue and the epiglottis. There is a small but noticeable opening of the velopharyngeal port, increasing nasality so typical of the belting sound. It has been previously noted (Sullivan 1985) that nasality is not a true component of belting, even though the style sounds nasal. In some preliminary work in which we’ve examined the superior portion of the soft palate with endoscopy, we’ve found rather that true nasality has been present in belting, even when there’s a conscious attempt to raise the velum to reduce nasality. Also noticeable in comparing the two side images is the difference in the opening between the teeth; belting has the larger opening, classical the smaller opening. So in belting, the angling of aperture is wider toward the front of the face and in classical, wider toward the rear of the head.



Video-Fluoroscopy, vowel “aa” on D 587 Hz, Classical



Video-Fluoroscopy, vowel “aa” on D 587 Hz, Belt

Since neither the cricoid or thyro-oid cartilages were visible using these methods, there were only two tell-tale signs of cartilage tilting. On the side view of belting using video-fluoroscopy, as the pitch ascended, there was a noticeable appearance of some "stretching" of the anterior portion of the thyro-arytenoid muscle. This may result in increased vocal fold tension, at least as viewed from the side, since this was not apparent from the frontal views. With endoscopy, it appears in belting as though the thyroid cartilage is tilting forward giving a clear posterior view of the arytenoid cartilages.

In summary, our findings were full of surprises. Even though previous research (Estill 1988, Sullivan 1985) has stated that belting uses a higher larynx position than classical, the subjective sensation in "good" belting production is of a lowered larynx producing a deep, full sound free of "strain" and shrillness. The posterior carriage of the tongue for belting was also unexpected, because while singing, one has no sense of the tongue bunching back. In beautiful belting, subjectively one has a sense of spaciousness in the pharyngeal area, so the extreme constriction of the pharynx is not sensed. We were surprised to see that there are differences in spinal angling between belting and classical which would contribute to a change in the resonating shape of the vocal tract. As expected, in classical production, the soft palate is held higher and is in a more closed position than in belt.

As for the usefulness of the modalities in comparing these two vocal techniques, there are limitations in the sole use of MRI for voice research, since the laying down position skews the results. However, used in conjunction with video-fluoroscopy and endoscopy, MRIs do add an extremely interesting and clear view. Video-fluoroscopy turned out to be a real winner as a study tool, the only drawback being the unnaturally raised head position required for a clear picture of the neck in frontal views.

Because science belies my pedagogical approach in some ways, I have made modifications in my own mind. But for the practical teaching of this technique, I will for now continue with my techniques and exercises because they work. If I tell my students to raise their larynges and shove their tongues back for belting, they will sound awful. Safe, yet powerful belting seems to benefit from a system which encourages laryngeal lowering, a sense of pharyngeal widening, the sensation of "the laryngeal lean" which results in a speech-like sound to the top of the range, lack of constriction in true and false cords, balanced and ever-shifting register changes using laryngeal sensations of thyro-arytenoid and cricoid-thyroid muscle activity, and extremely strong abdominal breath support (Popeil 1996).

We need to keep exploring this fascinating field and develop techniques that enable singers to pursue employment in a variety of vocal are-

nas. Singers today are saying "Show me the money!" and they're looking to us for the answers.

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Lisa Popeil, MFA in Voice from the California Institute of the Arts, is a mezzo-soprano who has sung in a wide variety of vocal styles including avant-garde opera, Bulgarian and North Indian singing, chamber work, and in session work for television, film, and commercials. For the latter, Ms. Popeil has sung in pop, jazz, rock, musical theater legit and belting, soul and country styles. She has performed with Frank Zappa, "Weird Al" Yankovic and the Pasadena Symphony. Lisa is also a skilled pianist, voice-over artist and film composer. Creator of the Voiceworks Method and "The Total Singer" instructional video (www.popeil.com), she lectures widely on the topic of non-classical voice technique including belting and style analysis, technique and performance.

A resident of Sherman Oaks, California, she continues to conduct voice research while overseeing her busy private studio which includes a theater, video and digital audio recording, demo production, and technique and performance coaching.
