

HISTORY CORNER

# The superior laryngeal nerve injury of a famous soprano, Amelita Galli-Curci

## *La lesione del nervo laringeo superiore di una famosa cantante, Amelita Galli-Curci*

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### SUMMARY

The superior laryngeal nerve (SLN) has been attributed much less clinical significance than the recurrent laryngeal nerve. It has sometimes been described as the ‘neglected’ nerve in thyroid surgery, although injury to this nerve can cause significant disability. The external branch of the SLN is the only motor supply to the cricothyroid muscle, which increases the tension of the ipsilateral vocal fold during high-frequency phonation, particularly in women and voice professionals. Damage to this nerve can manifest as ipsilateral cricothyroid muscle paralysis, and clinical symptoms may include a hoarse, breathy voice, frequent throat clearing, vocal fatigue or diminished vocal frequency range, especially when rising pitch. SLN paralysis can be a significant issue for those whose careers depend largely on a full range of voice. The famous opera soprano, Amelita Galli-Curci, suffered SLN injury during thyroid surgery with distressing consequences.

KEY WORDS: Thyroidectomy • Superior laryngeal nerve • Opera singer • Voice disorders

### RIASSUNTO

*Il nervo laringeo superiore (SLN) riceve generalmente un minor interesse clinico rispetto al nervo laringeo ricorrente, e qualcuno lo descrive come il nervo ‘trascurato’ nella chirurgia della tiroide, pur tuttavia una sua lesione può causare disabilità anche significative. Il ramo esterno del SLN è l’unico ramo motore del muscolo cricotiroideo, che aumenta la tensione della corda vocale omolaterale durante la fonazione ad alta frequenza, soprattutto nelle donne e nei professionisti della voce. Danni a questo nervo possono manifestarsi con la paralisi del muscolo cricotiroideo. I sintomi clinici di una lesione del SLN comprendono la raucedine e una voce soffiata, la necessità di schiarirsi frequentemente la gola, la fatica vocale o il diminuito range di frequenza vocale, soprattutto quando si innalza la frequenza della voce. La paralisi del SLN può essere un problema significativo per quei professionisti le cui carriere dipendono, in larga misura, da una completa estensione vocale. La famosa cantante d’opera, Amelita Galli-Curci, subì una lesione al SLN durante una tiroidectomia, con conseguenze drammatiche.*

PAROLE CHIAVE: Tiroidectomia • Nervo laringeo superiore • Cantante d’opera • Turbe della voce

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### Introduction

Amelita Galli, the greatest female opera singer of the early 20<sup>th</sup> century, was born in Milan in 1882 where she studied at the Music Conservatory. After graduating with a gold medal in piano in 1903, Amelita started giving piano lessons<sup>1-4</sup>. The composer Pietro Mascagni, a friend of the family, heard Amelita sing a soprano part during an opera recital at home and told her, “You have a unique timbre, and this is a rare gift... Remember there are many gifted pianists, but not so many singers. I advise you to become an opera singer”. Since her mother disapproved of the career of professional singers, and the family lacked the

money to hire teachers due to the collapse of her father’s business, Amelita taught herself to sing, practicing with Manuel Garcia’s exercises and using her voice to ‘play’ piano exercises<sup>1-4</sup>. Amelita’s grandmother, a former popular soprano, recommended some light soprano parts that were more suitable to her voice. Amelita finally made her operatic debut at the Teatro Costanzi, Rome’s leading Opera House, in 1906, in the role of Gilda in *Rigoletto* and she was soon acclaimed in Italy and Europe. In 1908, she married Marquis Luigi Curci di Simemi, and added his last name to her own.

Amelita Galli-Curci arrived in the United States in 1916, where she was virtually unknown (Fig. 1). Cleofonte Cam-



**Fig. 1.** Amelita Galli-Curci in 1918.

panini, art director and principal conductor of the Chicago Opera, engaged her for two performances at the price of \$300 each. Her first performance in Chicago as Gilda in *Rigoletto* was so successful that the newspaper presses were held up to make space for the review. Amelita accepted an invitation to stay with the Chicago Opera for the rest of the season<sup>3</sup>. In the Chicago Daily Journal, critic Edward C. Moore enthusiastically wrote, “There have been singers with voices limpid and pure; Galli-Curci is a little more limpid and pure. There have been singers of outstanding dexterity and flexibility, Galli-Curci is a little more dexterous and a little more flexible. There have been singing artists who made a successful effort to give a visual characterization of their role; Galli-Curci carried almost the entire burden of characterization. Few opera singers have been able to do all these things at once. Galli-Curci did them all and more”<sup>4</sup>. Giulio Gatti-Casazza (Fig. 2), General Manager of the Metropolitan Opera Company, engaged Galli-Curci to sing in New York. Her Metropolitan debut took place on

14 November 1921, as Violetta in *La Traviata* at the opening of the season. From then on, Amelita remained with the New York Metropolitan Opera Company until she retired from the stage. She renegotiated her contract with the Chicago Opera, receiving \$2,000 for each appearance in Chicago and \$2,500 each time she sang in New York, terms that were even better than for Enrico Caruso. The president of the Victor Talking Machine Company (later RCA), Calvin G. Childs, signed an agreement with Amelita Galli-Curci for recordings on the same terms as for Enrico Caruso, and she became one of the first female operatic stars of the phonograph; her records were instant bestsellers. “Caro nome” sold 10,000 copies in its first Chicago release alone, an unprecedented number for the time. On June 5, 1924, Amelita’s appearance at the Hollywood Bowl in Los Angeles drew an audience of 21,873 people, who paid a total of \$25,935, a record sell-out<sup>5</sup>. The singer was paid \$15,000 for her performance, the highest figure paid to a singer for a single performance at that time.

### Case history

Galli-Curci was a coloratura soprano, not a dramatic soprano. Her voice was better in recordings than on the stage because she could work for shorter periods, run re-takes, and escape the pressure of a critical audience. An adjective that live listeners used frequently for her voice was “celestial”<sup>6</sup>. By the end of the 1920s, an increasingly large thyroid goitre with a tumorous growth on the right side of Galli-Curci’s neck, which had been compressing her trachea for 15 years, was gradually restricting the passage of air<sup>1-3</sup>. Her voice began to suffer and her intonation was no longer secure, so in 1930 the operatic singer retired from the stage and continued her career in concert performances (Fig. 3). The large goitre continued to pose problems and, after an unsuccessful European tour, she finally agreed to undergo surgery. Dr. Arnold Kegel



**Fig. 2.** Giulio Gatti-Casazza (1869-1940).

Gatti-Casazza was born in Udine, in North-Eastern Italy. He graduated in Engineering at the Genoa *Naval School* of Engineering, then left the world of engineering to conduct the Opera Orchestra in Ferrara. In 1893 he succeeded his father Stefano, as director of the Municipal Theatre in Ferrara. He was called to Milan as General Manager of La Scala from 1898 to 1908, before his move to New York City where he was head of the Metropolitan Opera from 1908 to 1935. When he left Milan, Gatti-Casazza took Arturo Toscanini with him, the brilliant conductor who had led the orchestra at La Scala during Gatti’s years. In 1910, Gatti-Casazza married the soprano Frances Alda, from whom he divorced in 1928 to marry the opera-ballet dancer and choreographer Rosina Galli. Gatti-Casazza discovered many Italian singers and conductors, including Enrico Caruso and Arturo Toscanini, and the greatest opera singers in the world appeared at the Met under Gatti-Casazza’s management. Gatti-Casazza was a very successful administrator and considered a key factor in making the Metropolitan one of the world’s premier opera houses. Gatti-Casazza retired in 1935 and returned to Italy to direct the Ferrara Theatre until his death in 1940.



**Fig. 3.** Galli-Curci's tumorous growth on the right side of her neck.

performed a thyroidectomy under local anaesthesia on 11 August 1935, at the Chicago Polyclinic/Henrotin Hospital. During the 70-minute surgical procedure, the surgeon asked the patient to sing tones and scales five times in front of several music critics. He removed an adenomatous goitre weighing 185 g that displaced the larynx 4.5 cm to the left and reduced the diameter of the trachea by 50%<sup>27</sup>. At the end of the procedure, the soprano sang part of a duet from the Barber of Seville. Immediately afterwards, Galli-Curci was surprised to find her breathing much improved (Fig. 4). She performed her first vocal exercises in the hospital ward, and her voice was initially harsh. When one of the nurses commented that she sounded wonderful, Amelita replied bitterly, “Wonderful? It sounds like a circular saw hitting a rusty nail!”. Amelita was discharged from hospital on August 18 and returned to Los Angeles. Even before she left, she was euphoric about the airflow improvement she experienced following the surgery. On 19 August 1935, Time magazine wrote, “For 15 years what she affectionately called a ‘potato’ grew in the neck of Mme Amelita Galli-Curci,



**Fig. 4.** Galli-Curci in hospital after surgery. Courtesy of New York Public Library for the Performing Arts and Associated Press.

forcing her to adjust her coloratura soprano to 50% less wind volume. Last week in Chicago, while the one-time Prima Donna trilled tones and scales to show the effects on her voice, surgeons working with a local anesthetic successfully cut away a 6½-oz. goitre”. After her surgery, the singer declared, “My voice is free again, unbridled after years of fighting with the potato. The result of my operation is just short of marvellous. Even now, when I am not fully recovered, I need hardly open my mouth to obtain the pure tones difficult when the potato was in my throat... My voice is like a young colt, I will have to restrain it...”. After her operation, Amelita embarked on a lengthy period of scrupulous vocal retraining and voice studies with teacher Estelle Liebling<sup>8</sup>. On November 16, 1936, six years after retiring from opera and 16 months after surgery, the singer returned to the stage at the Chicago Civic Opera House, as a dramatic soprano (Mimi in *La Boheme*). The music critics unanimously criticized the singer’s interpretation and remarked on her lack of upper range, inability to sustain notes, and evident breathlessness. After the performance, Eugene Stinson of the “Daily News” wrote, “She had command neither of voice nor of breath”. Amelita Galli only sang at recitals from then on, and in 1938 she retired from the stage altogether. She died on 26 November 1963 in La Jolla, California, but the newspaper coverage of her demise was overshadowed by the assassination of J.F. Kennedy in Dallas<sup>1-3</sup>. In 1972, critic Simon Trezise chose Galli-Curci as “best soprano” of the 20<sup>th</sup> century.

## Discussion

The superior laryngeal nerve is a branch of the vagus nerve. After descending along the side of the pharynx, it divides into two distal branches, the internal and the external laryngeal nerves. The internal laryngeal nerve provides sensory innervation to the glottis and laryngeal vestibule through the thyro-hyoid membrane. The external laryngeal nerve (EBSLN), which is the smaller branch, innervates the cricothyroid muscle and also branches into the pharyngeal plexus and the superior portion of the inferior pharyngeal constrictor<sup>9-14</sup>. The cricothyroid muscle tenses the vocal cords and comes into play at frequencies above 150 Hz, so it is particularly involved in producing the high tones of the female voice. Lesions involving the recurrent laryngeal nerve (RLN) are usually easy to recognize with indirect laryngoscopy or fibre optic examination, but injuries to the external branch of the superior laryngeal nerve are often under-diagnosed because of limited or absent clinical signs<sup>9-15</sup>. Common symptoms in patients with EBSLN damage include vocal fatigue, breathiness, hoarseness and volume changes on loud phonation, and loss of the upper portion of the range of pitch<sup>16-19</sup>. In EBSLN injury, the edge of the cord affected may be irregular or wavy; it usually lies on a lower level, giving rise to an oblique glottic aperture;

it is sometimes shorter than normal and flaccid, bulging on expiration<sup>11-16,19</sup>. Roy recently noticed a deviation of the epiglottic petiole towards the side of cricothyroid muscle weakness using the voice at an extremely high pitch, and recommended considering this aspect as a diagnostic sign of EBSLN denervation<sup>20</sup>. There are several technical approaches designed to preserve the integrity of the EBSLN, including: isolating and individually ligating the superior pole vessels adjacent to the thyroid capsule; identifying the EBSLN prior to securing the vasculature in the same manner; and neuromonitoring of the EBSLN during thyroidectomy<sup>11-13,21</sup>. According to Friedman, the EBSLN is at risk in all patients until it has been identified<sup>12</sup>. Eckley et al. recorded hoarseness, loss of high range, vocal fatigue, breathiness and volume disturbance for the production of loud phonation in 56 patients (30 singers) as a consequence of EBSLN damage, which was confirmed by EMG and laryngostroboscopy; the high coloratura sopranos (like Galli-Curci) seemed to have the worst phonatory problems<sup>17</sup>. In patients with EBSLN damage who were not singers, Robinson et al. found a significant drop in maximum phonation time and range of phonation frequencies; and the percentage of jitter and shimmer, and the noise-to-harmonics ratio were abnormally high<sup>19</sup>. The true incidence of damage to the EBSLN after thyroid surgery is not clear, but its electromyographic incidence ranges from 0% to 58%<sup>11</sup>. In 1992, Cernea proposed a classification of EBSLN based on the potential risk of injury to the nerve during thyroid surgery according to its relationship with the upper edge of the superior thyroid pole; the author found the highest risk in cases with large goitres<sup>9</sup>. Aina and Hisham reported that approximately 50% of the nerves cross below the apex of the thyroid lobe in goitres weighing more than 100 g (like Galli-Curci's,) where they are at high risk of injury<sup>10</sup>. In 1951, during the removal of goitres, Moran and Castro deliberately traumatized the external laryngeal nerve with forceps in 8 patients: unilateral trauma produced a hoarse, monotonous voice for 5-7 days that subsequently "seemed to return to normal"; bilateral damage had the same effect plus fatigue, which persisted for at least 3 months and was permanent in one case<sup>14</sup>. Aluffi et al. found postoperative acoustic patterns altered in some patients with no objective evidence of damage to the laryngeal nerves, suggesting an extralaryngeal cause behind their vocal dysfunction, such as laryngo-tracheal fixation or iatrogenic lesions to the strap muscles<sup>11</sup>. The extralaryngeal muscles contribute to vocal function by modulating pitch range, so their action is important, especially in professional singers<sup>22</sup>.

## Conclusions

Crookes and Recabaren hypothesized that Amelita Galli-Curci's vocal decline was more likely a result of physiological vocal decline than a consequence of surgical trauma. To support this theory, the authors mentioned the

short careers of other famous coloratura sopranos<sup>7</sup>. Maria Callas (one of the most famous coloratura sopranos of all time) was recently revealed to have suffered from dermatomyositis, however<sup>23</sup>, while other coloratura sopranos such as Adelina Patti, Lily Pons, Joan Sutherland, and Montserrat Caballé, had very long careers. Be that as it may, by the age of 50 most operatic sopranos give up the coloratura roles, opting for lyric soprano roles more appropriate to their stage in life. Changes in voice are also not unheard of in the world of opera. The dramatic soprano Lilli Lehmann began her career as a coloratura soprano; and the coloratura sopranos Joan Sutherland and Montserrat Caballé became dramatic sopranos late in their careers. Tracheal compression caused by a goitre put an early end to Amelita Galli-Curci's career as a coloratura soprano, but it was nerve damage caused during surgery that prevented her from prolonging her career as lyric or dramatic soprano.

Following surgery, Amelita Galli-Curci suffered from hoarseness and told *Time* magazine, "the operation has pulled my voice way down and I would like to come back to opera as a lyric soprano instead of a coloratura." This transient postoperative hoarseness may have been caused by a unilateral superior laryngeal nerve lesion. After surgery, the singer probably lost the high upper extension of her voice due to EBSLN injury, which is why it took a long period of vocal training before she could return to the stage. Even today, the external branch of the superior laryngeal nerve is known as the "nerve of Galli-Curci"<sup>24</sup>.

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*In these vintage recordings, you can hear the voice of Amelita Galli-Curci.*

*1917 Victor recording of "Caro nome" from Verdi's opera "Rigoletto". [www.youtube.com/watch?v=eekUKcLIDk0](http://www.youtube.com/watch?v=eekUKcLIDk0)*  
*Amelita Galli-Curci, Dinorah: ombra leggera (Shadow Song). [www.youtube.com/watch?v=V1v\\_Iv2l78U](http://www.youtube.com/watch?v=V1v_Iv2l78U).*

## References

- 1 Craton J. *Amelita Galli-Curci*. [www.chez.com/craton/musique/galli-curci/english.htm](http://www.chez.com/craton/musique/galli-curci/english.htm)
- 2 Gulec SA, O'Leary JP. *Fable on the superior laryngeal nerve*. *Am Surg* 1999;65:490-2.
- 3 Le Massena CE. *Galli-Curci's life of song: a biography*. Palm Springs, CA: Monitor Book Co; 1977.
- 4 Amero RW. *Amelita Galli-Curci: a San Diego nightingale*. [www.balboaparkhistory.net/glimpses/curci.htm](http://www.balboaparkhistory.net/glimpses/curci.htm)
- 5 [www.hollywoodbowl.com/philpedia/hollywood-bowl-history/opera.cfm](http://www.hollywoodbowl.com/philpedia/hollywood-bowl-history/opera.cfm)

- <sup>6</sup> Stevenson J. All Music Guide. [www.classicalarchives.com/artist/10442.html#tv=about](http://www.classicalarchives.com/artist/10442.html#tv=about)
- <sup>7</sup> Crookes PF, Recabaren JA. *Injury to the superior laryngeal nerve during thyroidectomy: lesson or myth?* *Ann Surg* 2001;233:588-93.
- <sup>8</sup> Brower H, Cooke JF. *Great singers on great singing: a famous opera star interviews 40 famous opera singers on the technique of singing*. Mineola, NY: Dover Publications; 1996.
- <sup>9</sup> Cernea CR, Ferraz AR, Nishio S, et al. *Surgical anatomy of the external branch of the superior laryngeal nerve*. *Head Neck* 1992;14:380-3.
- <sup>10</sup> Aina EN, Hisham A. *External laryngeal nerve in thyroid surgery: recognition and surgical implications*. *ANZ J Surg* 2001;71:212-4.
- <sup>11</sup> Aluffi P, Policarpo M, Cherovac C, et al. *Post-thyroidectomy superior laryngeal nerve injury*. *Eur Arch Otorhinolaryngol* 2001;258:451-4.
- <sup>12</sup> Friedman M, LoSavio P, Ibrahim H. *Superior laryngeal nerve identification and preservation in thyroidectomy*. *Arch Otolaryngol Head Neck Surg* 2002;128:296-303.
- <sup>13</sup> Loré JM Jr, Kokocharov SI, Kaufman S, et al. *Thirty-eight-year evaluation of a surgical technique to protect the external branch of the superior laryngeal nerve during thyroidectomy*. *Ann Otol Rhino Laryngol* 1998;107:1015-22.
- <sup>14</sup> Moran RE, Castro AF. *The superior laryngeal nerve in thyroid surgery*. *Ann Surg* 1951;134:1018-21.
- <sup>15</sup> Tsai V, Celmer A, Berke GS, et al. *Videostroboscopic findings in unilateral superior laryngeal nerve paralysis and paresis*. *Otolaryngol Head Neck Surg* 2007;136:660-2.
- <sup>16</sup> Dursun G, Sataloff RT, Spiegel JR, et al. *Superior laryngeal nerve paresis and paralysis*. *J Voice* 1996;10:206-11.
- <sup>17</sup> Eckley CA, Sataloff RT, Hawkshaw M, et al. *Voice range in superior laryngeal nerve paresis and paralysis*. *J Voice* 1998;12:340-8.
- <sup>18</sup> Kark AE, Kissin MW, Auerbach R, et al. *Voice changes after thyroidectomy: role of the external laryngeal nerve*. *Br Med J (Clin Res Ed)* 1984;289:1412-5.
- <sup>19</sup> Robinson JL, Mandel S, Sataloff RT. *Objective voice measures in non-singing patients with unilateral superior laryngeal nerve paresis*. *J Voice* 2005;19:665-7.
- <sup>20</sup> Roy N. *Denervation of the external branch of the superior laryngeal nerve: laryngeal and phonatory features*. *Curr Opin Otolaryngol Head Neck Surg* 2011;19:182-7.
- <sup>21</sup> Mangano A, Dionigi G. *The need for a standardized technique in intraoperative monitoring of the external branch of the superior laryngeal nerve during thyroidectomy*. *Surgery* 2011;149:854-5.
- <sup>22</sup> Henry LR, Solomon NP, Howard R, et al. *The functional impact on voice of sternothyroid muscle division during thyroidectomy*. *Ann Surg Oncol* 2008;15:2027-33.
- <sup>23</sup> Giacobuzzo M. *Una malattia rovinò la voce della Callas*. [http://archiviodistorico.corriere.it/2002/ottobre/13/Una\\_malattia\\_rovino\\_voce\\_della\\_co\\_0\\_0210134315.shtml](http://archiviodistorico.corriere.it/2002/ottobre/13/Una_malattia_rovino_voce_della_co_0_0210134315.shtml).
- <sup>24</sup> Souba W, Fink MP, Jurkovich GJ, et al., editors. *ACS Surgery: Principles & Practice*. 6<sup>th</sup> edition. Hamilton, Ontario: BC Decker Inc; 2007.

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