

# The treatment of adult laryngeal hemangiomas located on the arytenoids: excision vs. Chemotherapy

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## Abstract

**Abstract Objective:** To evaluate the results of the excision and chemotherapy treatment methods for ALHs located on the arytenoids. **Study design:** retrospective study. **Methods:** Twenty-six ALH patients in 29 different cases were enrolled in the study. Some patients were treated more than once. Twenty-nine cases of ALHs treated with either chemotherapy or excision were studied to assess the efficacy of both treatments. **Results:** All the patients in the ALH excision group were cured, and the ALHs did not recur. The mean lumen constriction score for the chemotherapy group was 2.95. The score for the ALH excision group was higher than that for the chemotherapy group. **Conclusion:** Both chemotherapy and excision are safe and effective treatments for ALHs located on the arytenoids. On the condition that the ALH is well exposed and can be completely removed, ALH excision surgery is a better method to treat ALHs located on the arytenoids.

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### Abstract

**Objectives:** To evaluate the results of the excision and chemotherapy treatment methods for ALHs located on the arytenoids.

**Study design :** retrospective study.

**Setting and Participants:** Twenty-six ALH patients in 29 different cases undergoing chemotherapy or excision were enrolled at our Department between June 2012 and March 2021.

**Main outcome measures:** .The mean lumen constriction score for ALH.

**Results:** All the patients in the ALH excision group were cured, and the ALHs did not recur. The mean lumen constriction score for the chemotherapy group was 2.95. The score for the ALH excision group was higher than that for the chemotherapy group.

**Conclusion:** Both chemotherapy and excision are safe and effective treatments for ALHs located on the arytenoids. On the condition that the ALH is well exposed and can be completely removed, ALH excision surgery is a better method to treat ALHs located on the arytenoids.

**Key words:** chemotherapy; bleomycin injection; adult laryngeal hemangiomas; excision surgery; arytenoid

### Key Points

1. ALHs located on the arytenoids are a special kind of ALH because of the location and the morphological characteristics of the arytenoids.

2. ALHs can be successfully removed if they are pedunculated or limited to specific areas.
3. ALH excision is a better method to treat ALHs located on the arytenoids.
4. Before the ALH excision surgery, it must be determined whether the bases of the lesions are limited located on the arytenoids by the laryngoscope and contrast-enhanced CT.
5. On the condition that the ALH is well exposed and can be completely removed, ALH excision surgery is a better method to treat ALHs located on the arytenoids.

## INTRODUCTION

Laryngeal hemangiomas are relatively rare in the head and neck area. Most infantile laryngeal hemangiomas resolve on their own, but adult laryngeal hemangiomas (ALHs) do not tend to spontaneous resolve. ALHs located on the arytenoids are a special kind of ALH because of the location and the morphological characteristics of the arytenoids. Compared to other laryngeal hemangiomas, the loose connective tissue of the arytenoids can cause the base of ALHs to be more fully exposed. ALHs located on the arytenoids should be treated because food often goes through the arytenoids. A ruptured tumor can induce serious bleeding, causing blood to flow into the respiratory tract; this can result in death. Many methods have been used to treat ALHs. The optimal surgical approach remains controversial. Some authors advise against ALH excision<sup>1</sup>. However, Steiner and Ambrosch<sup>2</sup> state ALHs can be successfully removed if they are pedunculated or limited to specific areas. In this study, we review the results of 29 cases of ALHs located on the arytenoids to evaluate the treatment methods of excision and conventional chemotherapy.

## Patients and methods

This is a retrospective study. Twenty-six ALH patients who underwent 29 different procedures between them—conventional chemotherapy or ALH excision—at our department between June 2012 and March 2021 were enrolled in the study. The patients were divided into two groups, the ALH excision group (9 cases) and the conventional chemotherapy group (20 cases). The 20 cases in the conventional chemotherapy group received bleomycin injections. In the ALH excision group, three cases underwent “cold as a surgical instrument” therapy (which included the use of micro laryngeal forceps and micro laryngeal microscissors); two cases underwent holmium laser therapy; and four cases underwent CO<sub>2</sub> laser therapy.

ALH diagnoses were made based on patient history, laryngoscopic findings, and contrast-enhanced computed tomography (CT) (Figure 1). All the surgeries were performed under general anesthesia using a suspension micro laryngoscope. In the ALH excision group, hemangioma classification was done based on histopathological examination. However, in the conventional chemotherapy group, hemangioma classification was done based on morphology, according to the classification of tracheal hemangiomas<sup>3,4</sup>.

## Surgical procedures

A complete preoperative examination was performed prior to surgery to exclude systemic diseases. This included chest radiography, an electrocardiogram, hepatic and renal function tests, and other routine clinical tests. The ALH patients in the chemotherapy group were treated with bleomycin (1.5 million units/bottle) (Tianjin Tai-He Pharmaceutical, Tianjin, China). However, the ALH patients in the ALH excision group were treated using many methods (including CO<sub>2</sub> laser excision, holmium laser excision, and excision using cold micro surgical instruments).

## Resection of ALHs located on the arytenoids under a microlaryngoscope using cold micro surgical instruments

After general anesthesia, ALH patients were placed in a supine position, and a direct laryngoscope was used to expose the lesions. The microscope was then used to examine the ALHs. The ALHs were located on the arytenoids. After the base of the ALHs was explored, micro laryngeal forceps were used to elevate the ALHs. Next, laryngeal microscissors were used to separate the base of the ALHs and the normal tissue. Epinephrine-soaked cotton balls were used if the wound was bleeding.

## Resection of ALHs located on arytenoids under a microlaryngoscope using a CO<sub>2</sub> laser

After the larynges and adjacent sites were exposed using the laryngoscope, a WILD Heerbrugg M 655 microscope (WILD Heerbrugg, Jena, Germany) and 400-mm focal lens coupled with a LUMENISTM 40 model CO<sub>2</sub> laser (Lumenis Ltd., Yokneam, Israel) were used. Two hundred and seventy micron spots and the super-pulse mode at 5-7 W were used. After the ALHs were elevated using the micro laryngeal forceps, the CO<sub>2</sub> laser was used to remove the ALHs along the base of the lesions. One of the ALH patients had a tumor with a limited base and high volume. The CO<sub>2</sub> laser was applied after the volume of the ALH was reduced by siphoning off blood from the ALH using a 23-gauge needle.

### **Resection of ALHs located on arytenoids under a microlaryngoscope using a holmium laser**

A holmium laser (VersaPulse PowerSuite, Lumenis, Yokneam, Israel) with 550 micron end-firing fiber to deliver the laser beam was used. En bloc resection was performed at the base of the ALHs. The laser was set to deliver 3W of energy.

### **Chemotherapy for ALHs**

Bleomycin (1.5 million units/bottle) (Tianjin Tai-He Pharmaceutical) was dissolved in 5 mL of normal saline solution. A 23-gauge needle was used to inject the bleomycin into the ALHs until the surface of the ALHs became slightly pale. Multipoint injections were advised. Finally, epinephrine-soaked cotton balls were used to apply pressure to the ALHs for 5 min. The maximum dose per patient was 24 mg.

### **Evaluation of the therapeutic effect**

A 4-point scale used in previous studies was adopted to grade the therapeutic effect. A lumen constriction score (from 1–4) was used to evaluate the therapeutic effect, as follows:

- Grade I: No change
- Grade II: A decrease in the size of the lesion less than or equal to 50%
- Grade III: A decrease in the size of the lesion more than 50% but less than 100%; and
- Grade IV: Disappearance of the lesion and no recurrence for at least 1 year<sup>5,6</sup>.

### **Statistical analysis**

SPSS 21.0 (SPSS Inc., Chicago, USA) was used for the statistical analysis. An independent t-test was used to analyze the continuous variables. A Mann–Whitney U test was used to analyze the categorical variables. A P-value less than .050 was considered to be statistically significant.

## **RESULTS**

This study included 26 patients (10 males, 38.5%; 16 females, 61.53%). Patients ranged in age from 19–77, and the average age was  $54.73 \pm 14.44$  years. The presenting symptoms of the 26 cases were studied, and the occurrence rates were arranged from high to low. These symptoms included a globus sensation, blood-stained sputum, hemoptysis, pharyngalgia, and no symptoms at all.

Between the 26 patients, 29 operations were performed and three patients underwent two procedures. Of the 29 cases, nine were treated with ALH excision and 20 were treated with bleomycin injections. All the surgeries in both groups were successful. No serious side effects, such as tumor ruptures and ulcers, occurred. Any mild bleeding could be controlled by gargling with ice-cold water.

The difference of classification (including capillary and cavernous) between the two groups was not significant. The size of the ALHs was not significantly different between the two groups based on contrast-enhanced CT. Because the data relating to ALH size had skewed distribution, the data was squared after logarithmic processing. After the data conversion, the data had a normal distribution and was analyzed using a t-test. We found the size of the ALHs was not significantly different between the two groups based on contrast-enhanced CT. Furthermore, no difference was found in the results in terms of gender, age, ALH size, classification and ALH location in the two groups (Table 1).

All the patients in the ALH excision group were cured and experienced no recurrence. The mean lumen constriction score in the chemotherapy group was 2.95. The score in the ALH excision group was higher than in the chemotherapy group according to a Mann–Whitney U test (Table1; Figure 2). Side effects such as alopecia, tumor ruptures, ulcers, and pulmonary fibrosis were not observed in this study.

In our study, three patients were treated twice. One patient was treated by CO<sub>2</sub> excision after the bleomycin injection was unsuccessful. Two patients were treated with bleomycin injections again after the first bleomycin injection (Figure 3).

## DISCUSSION

ALHs that appeared to be bluish-red were commonly observed at or above the true cords<sup>7</sup>. Adult hemangiomas can be located on the laryngeal ventricle, the false vocal cords, the epiglottis, the arytenoids, the laryngeal vestibule, the aryepiglottic fold, or the pyriform sinus. Hemangiomas may be found in one or more locations, which makes the lesions more complicated. Active treatment is advised if the lesions are symptomatic or if they are growing. There is a risk of hemangiomas rupturing, which may induce serious bleeding and can result in death, as food may go through the arytenoids. Therefore, ALHs located on the arytenoids should be treated.

The optimal surgical approach to treat ALHs is still debated. Chemotherapy is an effective and safe method to treat haemangiomas<sup>8</sup>. In our study, 0.3 million units/mL bleomycin was used. Bleomycin can affect the G2 and S phases of fast-dividing cells and can induce DNA degradation in undercoiled chromatin regions<sup>9,10</sup>. The ALH excision surgery can be performed using many methods, such as using cold instruments, a holmium laser, and a CO<sub>2</sub> laser. Some authors consider that excision is not advisable for adult cavernous hemangiomas in view of the great diameter of vascular spaces and the significant diameter of vessels<sup>1</sup>. However, Steiner and Ambrosch<sup>2</sup> state that laryngeal cavernous hemangiomas can be successfully removed if they are pedunculated or limited to circumscribed areas.

In the retrospective study, we collected the data of ALH in the ALH excision group and chemotherapy group. We compared the baseline characteristics of ALH including: locations, classification, ALH size and demographic characteristics of the patients in two groups. No statistically significant between-group differences for either of the primary outcomes were detected. The indifference of ALH data meant the ALH in chemotherapy group might also surgically excisable. This might avoid bias in surgical selection.

Our study showed that all the patients in the ALH excision group were cured and experienced no recurrence. The curative effect in the ALH excision group was better than in the chemotherapy group. In addition, side effects such as tumor ruptures and haemorrhoea did not occur. Why did the ALH excision surgery have better results? First, ALH excision was used only when the ALH was located on arytenoids that were circumscribed. Second, the histological characteristic of arytenoids make ALHs located there different from ALHs located elsewhere, as the soft tissue of the arytenoids is loose. Furthermore, the CO<sub>2</sub> and holmium lasers can excise the base of hemangiomas if the laryngeal forceps clip the hemangiomas and the surrounding loose, soft tissue. Last, the bases of ALHs located on the arytenoids can be exposed more easily. The basal plane of ALHs located on the arytenoids can be parallel to the line of sight if the laryngeal forceps clip the lesions.

In our study, one patient treated with a bleomycin injection had a poor therapeutic result. The lesion was then excised using a CO<sub>2</sub> laser and a holmium laser. The CO<sub>2</sub> laser was applied after the volume of the ALH was reduced by siphoning off blood from the ALH using a 23-gauge needle.

ALH excision is a better method to treat ALHs located on the arytenoids. However, there is still a risk of the hemangioma rupturing and a risk of haemorrhoea. Before this surgery, it must be determined whether the bases of the lesions are limited located on the arytenoids by the laryngoscope and contrast-enhanced CT. Exploration before lesion resection is also necessary. If lesions cannot be completely removed during preoperative evaluation, alternative procedures must be used. It is important to have experienced doctors for successful surgery.

Numerous modalities in the treatment and management of hemangiomas have been proposed, inclu-

ding Nd:YAG laser excision<sup>11,12</sup>, CO<sub>2</sub> laser excision<sup>13</sup>, potassium-titanyl-phosphate (KTP) lasers<sup>14</sup>, electrocautery, cryotherapy<sup>15</sup>, sclerotherapy, interferon alfa-2a<sup>16</sup>, corticosteroids, embolization, and radiation therapy<sup>17,18</sup>. These methods can mainly be divided into excision methods and non-excision methods. For ALHs located on the arytenoids, the excision method produces better results. However, preoperative evaluation of the base of ALHs and surgical experience are critical.

## CONCLUSION

Both ALH excision and chemotherapy are safe and effective methods for the treatment of ALHs located on the arytenoids. The ALH excision method may get better results when the base of ALHs located on the arytenoids is circumscribed.

## AUTHOR CONTRIBUTIONS

All authors reviewed and approved the final version of the manuscript. This project was ratified by Institutional Review Board of our hospital and all of participants in the present study agreed to volunteer in this research.

## Acknowledgements/Funding Statement

The authors have stated explicitly that there are no conflicts of interest in connection with this article

Ethical considerations. The study was reviewed by our institutional review board, and determined to be exempt given that we were collecting measurements during routine operations without additional dissection.

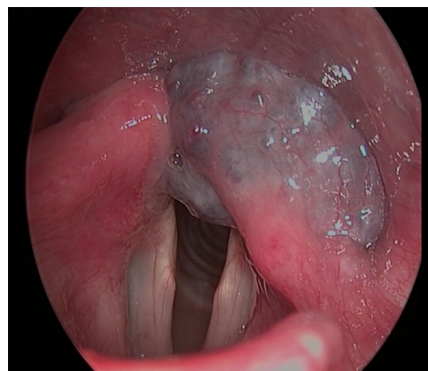
## Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request

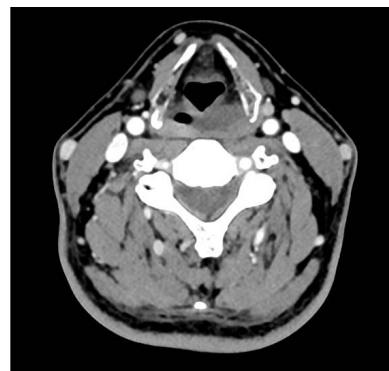
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A



B



## Hosted file

Table 1.docx available at <https://authorea.com/users/572801/articles/617486-the-treatment-of-adult-laryngeal-hemangiomas-located-on-the-arytenoids-excision-vs-chemotherapy>