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Papillomatosis of the larynx: treatment with CO2 laser

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Abstract. *Papillomatosis of the larynx: treatment with CO2 laser. Objectives*: We report our experience treating papillomatosis of the larynx using CO2 laser which has a lower risk of post surgical complications. Papillomatosis has a high incidence of recurrence after surgical treatment.
Methods: We treated 42 patients (10 adults and 32 children) affected by multiple papillomatosis of the larynx. Smaller papillomas were vaporized with a 7-8 Watt CO2 laser and larger papillomas were resected at the base of their implantation. A strict follow-up during the first 3 years after surgical treatment was necessary to manage recurrences with CO2 laser endoscopy.
Results: All patients presented with recurrences after the first surgical treatment, but within 18-60 months all patients presented a solution of their pathology. Post-operative complications were observed in patients who did not comply with the strict follow-up protocol and presented with large lesions requiring more invasive surgery.
Conclusions: CO2 laser endoscopy, although it did not prevent recurrences of papillomatosis in the larynx, is a valid surgical approach in the management of this pathology.

Introduction

Papillomatosis of the larynx is the most common benign laryngeal tumour in children. Its incidence is of 4.3 new cases for every 100,000 children yearly, while in adults the incidence is 1 new case for every 100,000.[1] The median age for a diagnosis of papillomatosis of the larynx is 3 years, with no gender differences in its incidence. On the contrary, it's more prevalent in adult males than females.[2] Papillomas are endoluminal and usually localized at the glottic level, but sometimes located in the vestibule of the larynx, at the subglottic level, or in the bronchus or trachea. Their growth is rapid, and they present a high risk for recurrence.[3] Human papilloma virus (HPV), especially HPV6 and 11, are present in these lesions as confirmed by different studies and methods (Southern blot, in situ ibridization, PCR).[4] A surgical approach is necessary to cure papillomas. Adjuvant medical therapies have been used with poor results. Interferon alpha (INF-α) 5 million units per dose delivered by subcutaneous injection 3 times weekly can be useful for maintenance therapy. However, significant rebound diseases (flu-like-symptoms and liver function abnormalities) have occurred upon cessation of therapy. In addition, this therapy is costly and requires frequent clinical visits for administration or family education.[5] Cidofovir, when used to treat papillomatosis of the larynx, is typically delivered by intralaryngeal injection to papillomatous lesions at the time of surgery. Although therapeutic results have been documented[6,7] controlled clinical trials are warranted as some reports demonstrate only transient therapeutic effects, or efficacy in only a small subgroup of patients.[7,8] Endoscopic surgery by CO2 laser, as reported by several authors[9-15] is a valid approach which presents advantages when compared to traditional surgery. The purpose of our study is to define how to perform this technique, explain its post-operative consequences, and demonstrate the validity of this approach in children affected by papillomatosis of the larynx.

Materials and methods

We observed 45 patients affected by papillomatosis of the larynx including 33 males and 12 females between the ages of 2 to 65 years (median age, 5 years). Forty-two patients (10 adults and 32 children) presented with multiple papillomatosis (93.3%), while 3 patients (all adults) presented with only one papilloma (6.7%).
We included only the 42 patients with multiple papillomatosis in our study. All of these patients had been referred to our ENT Department because they had dysphonia and dyspnea for at least

3 months. Among the adult patients with multiple papillomatosis, 5 (50%) had presented with multiple papillomatosis during infancy and were surgically treated in others hospitals. Papillomas had again appeared between the ages of 22 and 35 years.

Among the children, 5 (11.9%) had tracheal cannula due to a tracheotomy performed in other hospitals. In all 42 patients, the papillomatosis involved the glottic plane with a diffusion at the supraglottic region in 33 cases (6 adults and 27 children; 76.8%) or in the subglottic region in 9 cases (4 adults and 5 children; 21.4%). In 13 patients (4 adults and 9 children; 30.9%) the papillomatosis involved the anterior commissure of the larynx. In 4 patients (2 adults and 2 children; 9.5%) only the posterior commissure was involved, and in 2 patients (both children; 4.8%) both commissures were involved. In 23 patients (4 adults and 19 children; 54.8%) the laryngeal commissures were not involved.

To resect smaller papillomas, we used 7-8 watt CO2 laser impulses. We vaporized these smaller papillomas with the CO2 laser beam directed tangent to lesions (see Figures 1-3). Larger papillmas required a 10-15 watt CO2 laser that was continuous, not pulsatile. During the procedure, the base of implant of the papilloma is exposed with forceps and the resection is performed with the laser along the ideal plane that joins the portion of the vocal fold free margin in front of and behind the base of implant of papillomas.

Strict follow-up is necessary to avoid recurrences which may require more invasive surgical approaches. During the first 3 years after surgical treatment, patients were seen every 3 months; however, if the papillomatosis involved the anterior or posterior commissure, patients began with weekly visits for the first 5 weeks. If there was no recurrence after 3 years, patients were seen annually for another 3-4 years.

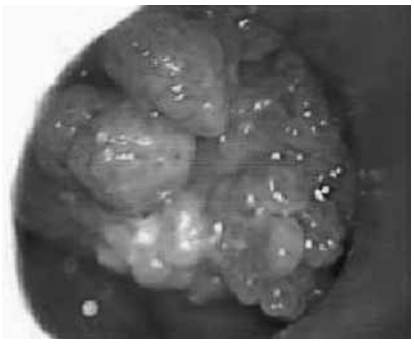

Figure 1
Multiple papillomatosis of larynx in a 7-year-old child.

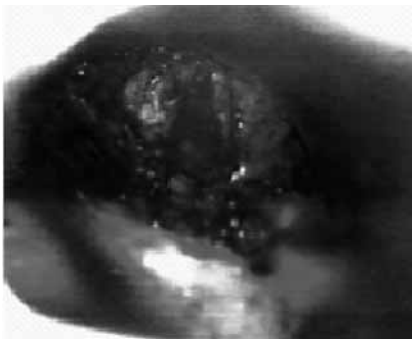

Figure 2
Intraoperative picture: after removing papillomas.

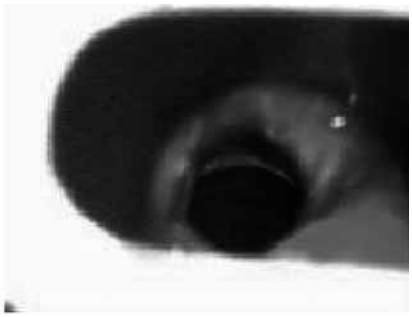

Figure 3
Follow-up after two months after surgical treatment.

Results

All patients presented with recurrences after the first surgical treatment. The CO2 laser endoscopy has been useful for diagnosis and treatment of these recurrences.

In the 18-60 months following the first surgical treatment, all patients could be considered recovered. A patient was considered recovered when the papillomatosis disappears for at least 3 years. If a papilloma appears 3 or more years after the first surgical treatment, it is not considered to be a recurrence due to the surgical approach.

Nine patients (21.4%) who observed our strict follow-up protocol were considered recovered within the first year after the first surgical treatment. In all these patients, we could immediately treat recurrent papillomas just as they appeared during the first 6 months of strict follow-up without having to resect large laryngeal mucosa areas.

Thirty-three patients (78.6%), who did not observe the follow-up protocol presented with large recurrent papillomas that required resection of large laryngeal mucosa areas. In this group of patients, we observed post-operative complications including dysphonia in 22 patients (52.4%), granulations in 5 patients (11.9%), and synechias at the anterior commissure in 5 patients (11.9%).

For one patient, a 7-years-old tracheotomized child, we used laryngeal dispositives (Montgomery T tube, Traissac tube) to avoid stenosis of the larynx during

the first 2 months following CO2 laser treatment.

Discussion

Papillomatosis of the larynx is the most common benign laryngeal neoplasm in children. Papillomas tend to grow primarily in larynx, but extralaryngeal sites often become involved, most commonly the trachea, esophagus, lungs, oral pharynx, oral cavity, and nasal cavity.[17,18] Adjuvant medical therapies have been used with inconsistent results. INF-α 5 million units per dose delivered by subcutaneous injection 3 times weekly can be useful for maintenance therapy. However, significant rebound diseases (flu-like-symptoms and liver function abnormalities) occurred upon cessation of therapy. In addition, this therapy is costly and requires frequent clinical visits for administration or family education.[5] Cidofovir, when used to treat papillomatosis of the larynx, is typically delivered by intralaryngeal injection to papillomatous lesions at the time of surgery. Although therapeutic results have been documented[6,7] controlled clinical trials are warranted because some reports demonstrate only transient therapeutic effects or efficacy in only a small subgroup of patients.[7,8]
CO2 laser endoscopy is an efficacious method to treat papillomatosis of the larynx, which has largely been used in the last few years.[1] The advantages of this surgical approach are:

– immediate hemostasis;
– accurate surgical excision of papillomas;
– reduced post-operative edema, which is important to avoid tracheotomy;
– reduced stay in hospital;
– respectful of the anatomical integrity of the larynx;
– good vowel results after surgery;
– possible to treat recurrences immediately.

Because of the high recurrence rate of papillomatosis of the larynx, strict follow-up is necessary. In our experience, patients who complied with the follow-up protocol were considered recovered within the first year following the first surgical treatment. In these patients, we were able to treat recurrent papillomas immediately as they appeared during the first 6 months without resecting large areas of the laryngeal mucosa. Patients who did not comply with this protocol commonly presented with large recurrent papillomas that required resection of large laryngeal mucosa areas. These patients experienced some post-operative complications:

– dysphonia in 22 patients (52.4%);
– granulations in 5 patients (11.9%);
– synechias at the anterior commissure in 5 patients (11.9%).

Tracheotomies were not necessary with the CO2 laser. Tracheotomy is necessary when papillomas reduce the respiratory space at the glottic level, inducing massive respiratory distress. Post-operative edema of the larynx can also reduce the respiratory space and make tracheotomy necessary. CO2 Laser endoscopy prevents edema and reduces the risk of tracheotomy.

For surgeons it is important to avoid tracheotomy because this approach:

– promotes the diffusion of papillomas to the broncus or trachea[3];
– modifies mucuciliar transport[2], so in some respiratory areas we observed metaplasia and mucus which facilitate the implantation of papillomas;
– induces metaplasia in scar tissue areas.[16]

Conclusions

CO2 laser endoscopy although it did not prevent recurrences of papillomatosis in the larynx, is a valid surgical approach in the management of this pathology because:

– prevents the diffusion of papillomas to the bronchus or trachea;
– gives the surgeon the ability to rapidly treat recurrences;
– prevents edema of the larynx and consequently tracheotomy;
– with a strict follow-up protocol, it reduces the risk of post-operative complications (dysphonia, granulations and synechias) that can occur from more invasive procedures.

A strict follow-up protocol is absolutely necessary to reduce complications that could result from large recurrent papillomas, which may require more aggressive surgical resection.

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