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Original article

Insights into laryngeal papillomatosis: Diagnostic challenges, therapeutic advances, and evolutionary patterns

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Abstract

Introduction: Laryngeal papillomatosis (LP) is caused by human papillomavirus (HPV), primarily types 6 and 11. LP is a benign papillary tumor of squamous cell origin that develops in the larynx and is most observed in children. This study aims to describe the diagnostic features and clinical course of laryngeal papillomatosis, and to review recent advances in its etiopathogenesis and treatment.
Patients and Methods: We conducted a retrospective, descriptive study of 20 cases of laryngeal papillomatosis diagnosed over a 32-year period (January 1990 to December 2022) in the ENT and Head and Neck Surgery Department.
Results: The mean age of patients was 24 years, with a bimodal age distribution: a juvenile form (55%) and an adult form (45%). The cohort included 12 males (60%) and 8 females (40%). All patients underwent surgical removal of papilloma, with 13 patients (65%) also receiving adjuvant treatment with bleomycin and antiviral therapy. Tracheotomy was performed in 6 patients (30%). Outcomes included remission in 5 patients (25%), disease recurrence in 17 patients (85%), and malignant transformation in 5 patients (25%).
Conclusion: Laryngeal papillomatosis remains a challenging condition due to its complex etiopathogenesis, variable clinical presentation, and unpredictable course, which can be life threatening. LP diagnosis remains primarily clinical.

Keywords: Larynx Papilloma, Papilloma virus, Recurrence, Malignant transformation.

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1. Introduction

Laryngeal papillomatosis, caused by HPV infection, primarily HPV-6 or HPV-11, presents a wide range of clinical trajectories, raising important questions about the factors that determine the disease's evolution. Some cases progress aggressively, with rapid lesion growth that can lead to increased respiratory complications, while others exhibit a more benign but recurrent form characterized by frequent relapses. The variability in recurrence rates appears to be linked to host factors, viral virulence, or differences in immune response, yet these remain poorly understood. Additionally, in certain patients, particularly adults, malignant transformation can occur, prompting questions about the biological mechanisms that favor these adverse evolutions [1-4].

This study aimed to analyze the long-term clinical course of laryngeal papillomatosis in a 32-year cohort, with particular focus on age-specific patterns of disease progression, treatment outcomes in resource-constrained settings, and risk factors for malignant transformation in our ENT and Head and Neck Surgery Department.

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2. Patients and methods

We conducted a retrospective descriptive study conducted in the ENT and Head and Neck Surgery Department over a period of 32 years, from January 1990 to December 2022. All patients with LP confirmed by direct laryngoscopy and histological examination were included in this study. We excluded patients having either incomplete medical records or insufficient follow-up duration (<3 months).

The parameters studied were age, gender, duration of symptoms, functional signs, clinical examination data, endoscopy data, pathological examination data, therapeutic management, and progression (remission, recurrence, or malignant transformation).

Juvenile onset respiratory papillomatosis (JORPP) is defined by the first appearance of symptoms before the age of 12 and generally manifesting between the ages of 2 and 4. Adult-onset respiratory papillomatosis (AORPP) is defined by the appearance of clinical manifestations between the second and fourth decades of life [5].

The study cohort was identified by cross-referencing three data sources: Operating room registries, inpatient hospitalization records, and histopathology reports.

The data were analyzed using SPSS version 25 (IBM Corp.), a software program specializing in statistical data processing.

The study protocol has been approved by the ethics committee of the Faculty of Medicine of Djibouti.

3. Results

Demographics

We collected 20 cases of PL over a period of 32 years. This represents an incidence of 0.625 new cases per year. There were 12 male cases and 8 female cases, giving a sex ratio of 0.5. The average age of our patients was 24 years, with ages ranging from 1 to 56 years. Two frequency peaks were noted during the first and fifth decades of life, corresponding to two groups of diseases: a group of young patients (juvenile form): comprising 11 children (55%) aged between 1 and 17, with an average age of 4.5 years, and a group of adult patients (adult form): comprising 9 cases (45%), aged between 22 and 56 years, with an average age of 39 years.

Clinical Presentation

The average time between the onset of the first symptoms and the first consultation was one and a half years, ranging from two months to 27 years. Maternal history revealed only one case of genital warts in mothers who delivered vaginally. The functional symptoms began in all patients with chronic dysphonia (100%), accompanied by laryngeal dyspnea in 7 of them (35%).

Endoscopy was performed in all patients, revealing exophytic, friable, whitish-pink lesions. The glottic level was affected in all cases (100%), the supraglottic location was found in 8 cases (40%), and the subglottic location in 4 cases (20%) (Fig. 1 and 2).

A pathological examination was systematically performed on all our patients before the start of treatment to confirm the diagnosis of laryngeal papillomatosis. Endoscopic peeling with forceps under direct laryngoscopy was performed in all patients, averaging 6 sessions spaced 45 days apart.

Treatment

Tracheotomy was performed in 6 patients (30%), including 4 cases in extreme emergency due to severe laryngeal dyspnea (20%) and the other 2 cases were performed in deferred emergencies, before endoscopy. All tracheostomized patients were able to undergo decannulation within varying time frames, except for one patient who underwent total pharyngolaryngectomy due to malignant transformation. The decannulation time was 2 months for 2 patients, 5 months for 2 patients, and 10 months for one patient. None of our patients received laser vaporization treatment or microdebrider use due to a lack of technical facilities. We used two medical treatment modalities in 13 patients (65%), antiviral treatments and antimetabolites (bleomycin).

Evolution

Malignant transformation occurred in 5 patients (25%) with an average time to onset of 12.2 years. The most common histological type was well-differentiated non-keratinizing squamous cell carcinoma in 4 patients (80%) and well-differentiated keratinizing squamous cell carcinoma in a single case (20%). The presence of HPV infection markers was identified in 3 cases of malignant transformation (60%).

The staging generally included in all cases (5 cases, or 25%) a laryngeal and thoracic CT scan, and the TNM UICC/2017 classification was established. The laryngeal CT scan confirmed a malignant tumor lesion in 5 cases (100%). The chest CT scan showed lesions consistent with lung metastasis in one case. It showed bilateral emphysema bubbles in one case. Otherwise, the chest CT scan was free of any suspicious lesions.

The choice of treatment depended on the TNM stage and the possible presence of local or distant metastases. Treatment decisions were made during multidisciplinary meetings.

Treatment generally consisted of a total laryngectomy extended to the piriform sinus with functional and bilateral lymph node dissection selective followed by radiotherapy in one patient (20%) classified as T4N2M0, a total larynx-gectomy combined with functional lymph node dissection followed by radiotherapy in two cases (40%) classified as T4N0M0, a laryngeal preservation protocol in one patient (20%) classified as T3N0M0, and palliative chemotherapy in a single case classified as T4N2M1 (Table 1).

The progression of patients who developed malignant transformation was marked by remission with periods of regression ranging from 2 to 10 years in 4 patients (20%). The fifth patient died from palliative chemotherapy.

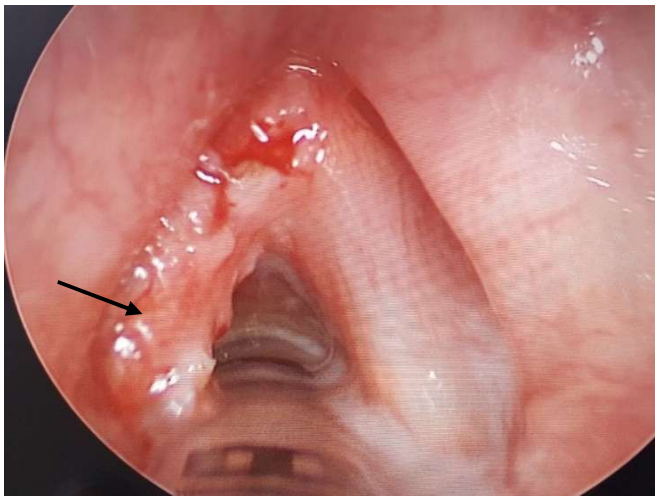

Fig. 1. Laryngeal papillomatosis of the left vocal cord

4. Discussion

PL is rare in developed countries. In the Western world, LP prevalence is estimated at 4 per 100,000 children, while in Australia (2000–2013), it was 0.81 per 100,000 children under 15, peaking at 1.1 per 100,000 among those aged 5–9. Its incidence is estimated at 3.6 per 100,000 inhabitants per year in Denmark and 4.3 per 100,000 inhabitants in the United States (2017) [1]. In France, there are 300,000 new cases per year [2]. In our study, we identified 20 cases of LP over a period of 32 years, which equates to an annual frequency of approximately 0.65 cases per year.

LP is primarily a childhood condition, with 40% of our patients aged between 1 and 10, with an average age of 24 years. This predominance in children has been reported by

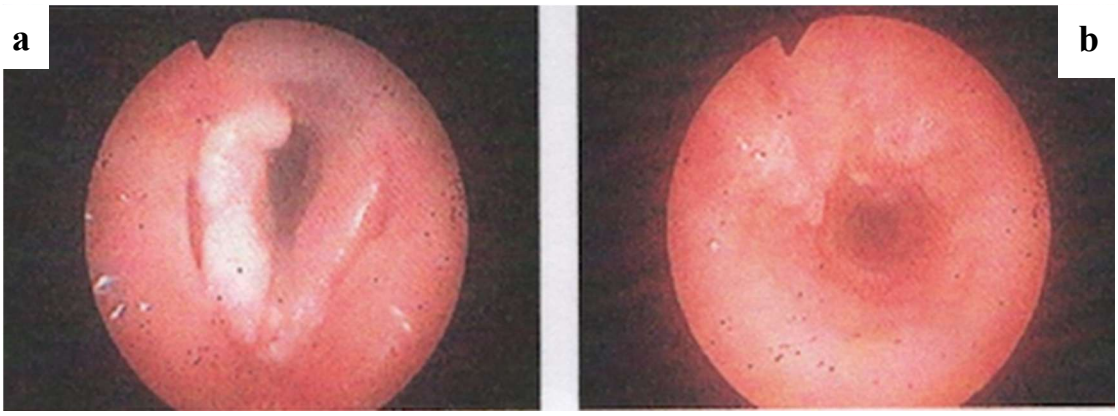

Fig. 2. Direct laryngoscopy (a) and tracheoscopy (b) showing laryngo-tracheal papillomatosis reaching 4cm from the carina

Table 1. Summary of patients who developed malignant transformation

Patient	Age (years)	Time to malignant transformation	Histological type	HPV	TNM	Treatment	Evolution
1	43	3 years	Well-differentiated SCC	-	T4N0M0	Surgery + RT	Remission with 8-year follow-up
2	56	12 years	Keratinizing SCC differentiate	+	T4N0M0	Surgery + RT	Remission with 5-year follow-up
3	3.5	23 years	Well-differentiated SCC	-	T3N0M0	Laryngeal organ preservation protocol	Lost to follow-up after 2 years
4	49	10 years	Well-differentiated SCC	+	T4N2M0	Surgery + RT	Remission after a 10-year decline
5	22	13 years	Differentiated SCC	+	T4N2M1	Palliative chemotherapy	Died from chemotherapy

SCC: squamous cell carcinoma; RT: radiotherapy

several authors [2-3-4]. However, studies show that there are two age peaks for the onset of the first symptoms, with a first peak around the age of 2 to 5 and a second peak around the age of 20 to 30. The literature refers to two forms of LP: JORPP and AORPP [5].

Our sample consists of 12 male patients and 8 female patients, giving a male/female ratio of 1.5. This male predominance is a classic finding widely reported by many authors [1-2-4].

This unique epidemiological pattern highlights the importance of targeted preventive measures - such as HPV vaccination before sexual debut and maternal condyloma screening - which could significantly reduce the incidence of this chronic, debilitating condition. The persistence of male predominance across both age groups suggests complex interactions between biological and exposure factors that warrant further investigation to optimize therapeutic approaches and public health strategies. Current evidence underscores the need for sex-specific considerations in both clinical management and research efforts for this challenging airway disorder.

All patients were presented with chronic dysphonia. The association of dysphonia and dyspnea illustrates a delay in diagnosis according to the literature. In our series, it was 35%, which is comparable to the result found by Ndour [7], who found an association of dysphonia and dyspnea in 35.5%, and the series by Maliki et al. [6] found isolated dysphonia in 47.61% and associated with dyspnea in 42.85% (Table 2).

Table 2. Distribution of functional signs according to published reports

Authors (year)	N	Dysphonia (%)	Dyspnea (%)	Dysphonia + Dyspnea + Cough
Nao et al. (2022) [4]	31 cases	35.48%	54.8%	6.45%
Maiga et al. (2018) [3]	49 cases	33.34%	58.34%	2.08%
Sereme et al. (2016) [8]	51 cases	49%	45%	4%
Pegbessou et al. (2014) [44]	39 cases	48%	31%	3%
Our study (2025)	20 cases	60%	35%	5%

The time between the onset of the first symptoms and the first consultation varies from 6 months to 5 years. It was 10 months in the Maliki et al. series [6] and 4.5 years in the Maiga S, et al. series [3]. In our series, we noted an average consultation time of 1.5 years, with extremes ranging from 2 months to 27 years. This delay highlights potential gaps in awareness or diagnosis.

Direct laryngoscopy provides a positive diagnosis. It allows for precise mapping of the lesions and biopsies to be performed for histological confirmation [7]. The diagnosis is made based on the visualization of raspberry-like, pink, grayish, clustered lesions. They begin on the floor of the ventricles, on the anterior commissure, and on the anterior third of the vocal cords and can extend to the entire larynx

or even the hypopharynx and tracheobronchial tree [1,8].

In our study, the glottic location was consistent, explaining the presence of dysphonia in all our patients, which is consistent with the data in the literature [1-7]. According to Nao et al. [4], the predominance of this location at the glottis is explained by the development of papilloma in the transition zones between the stratified and ciliated epithelium. These transition zones are mainly present in the endo-larynx, particularly at the glottic level.

Subglottic localization was observed in 20% of cases. This localization is dramatic, presenting immediately in the form of dyspnea, and is thought to be linked to the reduction in the caliber of the airway at this level [8]. It is a prognostic factor [9]. For Ndour et al. [7] and Maiga et al. [3], subglottic extension accounted for 29% and 37.5% respectively (Table III). For Ndour et al. [7] and Maiga S et al. [3], subglottic extension accounted for 29% and 37.5% of cases, respectively (Table 3).

Table 3. Different locations of laryngeal papillomatosis according to authors.

Authors (year)	Number of cases	Glottis (%)	Supraglottic (%)	Subglottis (%)
Maiga et al. (2018) [3]	49 cases	100 %	34.41 %	37.5 %
Maliki et al. (2012) [6]	21cases	100%	14.28%	28.57%
Zouak et Raji (2011) [40]	20 cases	95%	45%	20%
Ndour et al. [7]	31 cases	41.9%	12.9%	29%
Our study (2023)	20 cases	100%	40%	20%

Anatomical pathology studies should be performed after each peeling session, particularly in young subjects or when there is a risk of malignant transformation. The descriptions of histological and cytological abnormalities are almost identical, with stratified squamous epithelium forming exophytic lesions.

The types of HPV involved in this condition are HPV-6 and HPV-11. HPV genotyping of all patients with LP is essential both for diagnosis and as a prognostic factor, as HPV-11 is found in 50-60% of LP cases and is characterized by a rather aggressive clinical course, while HPV-6 is present in 20-40% of LP cases and is less aggressive, requiring less frequent surgical intervention [10-11].

Despite the many treatments currently available, management remains difficult. The treatments offered have two objectives: symptomatic treatment, which aims to clear the airways while avoiding scarring as much as possible and preserving laryngeal function, and curative treatment, which fights HPV infection.

The type of symptomatic treatment offered depends on the technical facilities available. Surgical management was based on the instrumental removal of papillomas by peeling in all our patients (100%). This peeling has multiple complications; it promotes bleeding, which reduces visibility during the procedure, can sometimes cause trauma leading to alteration of the mucosa where new papillomas grow, and promotes the risk of laryngeal stenosis and tracheobronchial extension of the lesions [4-6-12-13].

Endoscopic CO2 laser vaporization is the gold standard method increasingly used in developing countries. The laser offers highly selective destruction of papillomas with a lower risk of bleeding (excellent hemostasis) and less or no postoperative edema [14].

However, it carries risks of tracheobronchial dissemination, as HPV has been isolated in laser smoke [15].

The use of lasers may also be associated with an explosion risk. This risk is secondary to the combination of anesthetic gas leakage and perforation of the tracheal tube by laser shots [16].

According to a European multicenter study published in 2016 by Papaspyrou et al. analyzing the benefits of laser compared to other therapeutic modalities for PL in 60 patients, no significant difference was observed between patients treated with laser and those treated with cold instruments [12].

The microdebrider has recently been proposed for the treatment of LP. This procedure involves adapting endoscopic equipment used in the nasal cavities and sinuses to the larynx to perform papilloma excisions [13]. It allows the exophytic lesion to be resected using the cutting blade located inside the case.

The vocal outcome and postoperative results are better compared to CO2 laser. However, the microdebrider carries a higher risk of bleeding during the procedure.

In addition to surgical treatment, numerous medical treatments have been proposed for the treatment of LP. According to a prospective study by Mitra et al. [19], the use of acyclovir after surgical excision of papillomas leads to a reduction in the number of surgical procedures required to control the disease and a significant increase in the average intervals between surgical procedures.

In our study, acyclovir was used in 8 patients (40%) as adjuvant therapy after surgical excision at a dose of 5 mg/kg/8h, with no difference noted compared to other patients.

Studies have observed that the average interval between surgical interventions and the number of required surgical procedures was significantly lower when acyclovir was used as a postoperative adjuvant compared to surgery alone.

Several authors report the success of cidofovir in the treatment of LP, with durable and complete or partial remission of papillomatous lesions observed in the majority of treated patients [6-8-20-21-23], according to Derkay et al. [22] The indications for cidofovir are the need for 6 or more surgical procedures per year to control the disease, a reduction in the intervals between surgical procedures, and extra-laryngeal spread of the disease.

According to several therapeutic trials, treatment with interferon has reduced the number and frequency of surgical procedures and avoided the need for tracheotomy. However, recurrences occur when treatment is stopped, with a phenomenon of escape [21-23-24].

Treatment with bevacizumab in patients with severe LP

with tracheobronchial involvement reports a significant improvement in the disease.

Zeitels et al. [25] also report a synergistic effect in the treatment of LP by combining the anti-angiogenic agent bevacizumab intra-lesionally with KTP laser photoangiolysis.

Roger et al. [26] administered intra-lesional bevacizumab to 10 patients with severe LP requiring more than four surgical procedures in one year. The median time between surgical procedures increased by 5.9 weeks after bevacizumab, and the median number of procedures per year decreased by four.

Zur and Fox [27] administered intravenous bevacizumab at a dose of 10 mg/kg by infusion in a 12-year-old patient diagnosed at the age of 1 with severe papillomatosis affecting the trachea and bronchi. A remarkable improvement in the disease was observed after 6 weeks of treatment.

After 3 months of bevacizumab, the papillomas had completely disappeared from the larynx and had almost disappeared from the trachea. Five months later, a CT scan was performed, showing complete disappearance of the pulmonary nodules of the papillomas.

Photodynamic therapy is a minimally invasive and low-toxicity treatment strategy that selectively targets pathological cells and tissues by releasing extremely toxic singlet oxygen and other harmful oxygen radicals following the activation of the photosensitizing agent by light. Widely studied as a treatment for LP, it has resulted in a slight decrease in the growth of respiratory papillomatosis [28].

According to a literature review conducted by Lieder et al. [29], there is insufficient evidence from high-quality randomized controlled trials that photodynamic therapy (PDT) modifies disease progression. PDT certainly remains an area for future study.

The use of the HPV vaccine as both a preventive and therapeutic measure in recurrent respiratory papillomatosis (RRP) carries significant clinical, economic, and public health implications. Clinically, a meta-analysis by Rosenberg et al. [21] demonstrated a marked reduction in the number of monthly surgical procedures post-vaccination, with the mean intersurgical interval increasing from 7.02 months before vaccination to 34.45 months afterward, suggesting a disease-modifying effect.

These findings are supported by Hočevar-Boltežar et al. [30], who observed a significant extension of this interval in 11 patients. However, Hermann et al. [31] found no significant change in 9 patients followed for only 12 months, raising the question of whether this lack of effect stems from RRP's naturally fluctuating course or an insufficient observation period to assess the vaccine's true impact. Pathophysiologically, the vaccine's therapeutic effect may involve enhanced immune recognition of HPV 6/11 (the primary causative agents of RRP), potentially reducing viral load or suppressing reactivation, though complete eradication remains unlikely due to viral latency. Economically, fewer surgical interventions would lower hospital costs (reduced operating room use, anesthesia, and postoperative care), though cost-effectiveness studies comparing the vaccine to other adjuvant therapies (e.g., cidofovir) are still needed. From a public health perspective, these findings could justify expanding vaccination recommendations to RRP patients and reinforce the case for universal vaccination (including males) to reduce HPV 6/11 transmission. However, uncertainties remain regarding the optimal vaccination protocol (dosing, timing) and the durability of its therapeutic effects, necessitating longer-term studies in larger cohorts to validate these preliminary observations.

Other adjuvant alternatives have been proposed with significant results. Indole-3-carbinol and its derivatives (I-3C) have been shown to reduce the growth of papillomas in vitro by modifying estrogen metabolism.

Rosen et al. [32] reported in a prospective study of 33 adult and pediatric patients in which I3C was administered as a treatment for LP that 67% (22 out of 33 patients) had a complete or partial response.

Intralesional injection of the measles, mumps, and rubella (MMR) vaccine as an adjuvant therapy was considered an intriguing hypothesis requiring further investigation [33-34-35].

According to experimental research on the therapeutic effect of the MMR vaccine on juvenile-onset LP conducted by Wang et al. [36] in 2019, local application of the MMR vaccine as an adjuvant therapy can significantly reduce HPV viral load by inhibiting HPV DNA replication, but the curative effect still needs to be confirmed by randomized studies.

A retrospective study comparing cidofovir and MMR vaccine as adjuvant treatments in a pediatric population found no significant differences between children treated with intralesional injections of cidofovir and MMR after debridement [37].

HspE7, a recombinant fusion protein of heat shock protein 65 (Hsp65) from Mycobacterium bovis bacillus Calmette-Guérin (BCG) and HPV type 16 E7 protein, has been used as an adjuvant treatment for LP [38].

In an open-label study of 27 pediatric patients with LP, the median interval between surgical procedures after treatment with HSP-E7 was significantly longer than the median interval before treatment [22].

There are few complications associated with HspE7, only mild to moderate reactions at the injection site. Although there are no ongoing clinical trials to study the efficacy of HspE7, it is a promising treatment [39].

The number of recurrences is a prognostic factor, as these recurrences require repeated microlaryngoscopic procedures, which are not without complications [4]. It has been reported that the functional prognosis is related to the frequency of forceps peeling.

Literature distinguishes between two progressive forms of LP, regardless of age or the initial appearance of the lesion: Benign forms, defined by spaced recurrences, with one or two direct laryngoscopies per year. The main symptom is dysphonia. Healing occurs regularly, either spontaneously or after a few sessions of papilloma removal. According to studies, it accounts for 19 to 76% of progressive forms of LP [4,40,41]. In our series, it was 40% of 8 patients.

Aggressive forms are defined by rapid growth and recurrence, by their large size, and by their spread beyond the larynx, especially to the trachea, bronchi, and even the lung parenchyma. The need for more than 10 interventions in total or more than 3 interventions per year, a tracheotomy, or if it spreads subglottically [42-43]. In our series, it was 60%.

Papillomatosis can spread to all structures surrounding the larynx, particularly the trachea, manifesting as progressive inspiratory dyspnea, which can progress to acute respiratory failure and more frequent recurrences of the disease. In our study, it was observed in only one case (5%), which is consistent with the data in the literature, as authors report a frequency of 3-5% of tracheal localization [8-44].

Malignant degeneration of LP into cancer is possible with long latency periods, occurring in 3-9% of cases [45]. Young age at diagnosis, HPV11 genotype, and long disease progression are risk factors for malignant transformation [41-45]. The most frequently found histological type was well-differentiated non-keratinizing squamous cell carcinoma in 4 patients (80%) and well-differentiated keratinizing squamous cell carcinoma in a single case (20%). HPV types 6 and 11 are implicated in the malignant transformation of LP. Indeed, Huebbers et al. [43] demonstrated the integration of low-risk HPV into the cellular genome, thereby inducing carcinomatous proliferation. In our series, malignant degeneration was observed in In 5 patients (25%), markers of HPV infection were identified in 3 cases of malignant transformation (60%), type 11 in two patients and type 6 in one case.

HPV genotyping was performed only in patients with malignant transformation since it's more clinically relevant for oncogenic lesions (HPV-16/18) than for benign forms (HPV-6/11). While this approach was justified by clinical and economic considerations, it introduces important limitations. The selective genotyping creates a sampling bias and prevents analysis of how viral strains may influence disease progression. This methodological constraint highlights the need for more comprehensive studies with systematic genotyping to better characterize viral profiles in respiratory papillomatosis and their clinical implications. The current findings should therefore be interpreted with caution regarding strain-specific effects.

The 25% malignant transformation rate observed in our study (20 patients over 32 years) significantly exceeds the 3-9% typically reported, potentially reflecting several methodological and cohort-specific factors. The extended follow-up period (32 years) may have captured late transformations rarely documented in studies with shorter observation times. Our single-center, small cohort (n=20) likely exhibits selection bias toward more severe or recurrent cases, overrepresented in a referral center setting. The lack of systematic HPV genotyping leaves open the possibility of high-risk HPV strain predominance in transformed cases. Additionally, unrecorded cofactors like smoking, irradiation, or immunosuppression might have contributed to this elevated rate. These findings highlight the need for standardized, multicenter long-term studies to better define the true malignant potential of laryngeal papillomatosis, particularly in chronic, progressive forms. The disparity underscores how extended surveillance in specialized centers may reveal higher transformation risks than generally appreciated in broader populations.

The functional prognosis of LP is mainly influenced by changes in voice quality. This change is both the result of the natural history of the disease and the result of surgery to remove the papilloma. The prognosis may also be life threatening. In severe cases, uncontrolled proliferation of papillomas can compromise the airways, posing a life-threatening risk in the absence of urgent intervention [4-6-22].

Our study has certain limitations inherent to its retrospective design and the small number of analyzed cases, which may affect data completeness and the representativeness of our results for the general population with laryngeal papillomatosis. The lack of long-term patient follow-up and potential selection bias limit the scope of our conclusions and their extrapolation to other clinical contexts. These methodological constraints highlight the need for prospective studies with larger cohorts to confirm our observations.

5. Conclusion

LP, though rare, is the most common benign laryngeal tumor in children. It is a relatively rare condition. It is a pathology that remains puzzling due to its etiopathogenesis, clinical aspects, and unpredictable progression, which can be life-threatening. Its diagnosis is essentially clinical, facilitated by nasofibroscopy, but histological confirmation is necessary. Management focuses on symptomatic relief through papilloma removal. In our practice, this involves peeling with forceps. However, these procedures, which aim to restore the freedom of the airways, can lead to subglottic stenosis, extension of the lesions, and recurrence, which is a major characteristic of this disease.

Although the treatment of papillomatosis remains symptomatic to date, several drugs are available to reduce recurrences and lengthen the time between recurrences. Its unpredictable course requires regular monitoring of patients for early detection of recurrence. Histological examination is necessary even in children, given the risk of malignant transformation of papillomas. Our findings of a 25% malignant transformation support lifelong surveillance. Prevention includes vaccinating girls before puberty and treating genital warts in mothers.

Ethics approval

The study protocol has been approved by the ethics committee of the Faculty of Medicine of Djibouti

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Declaration of Competing Interest

No conflict of interest to disclose.

Authors' contributions

MEO: Data collection and analysis, and drafting paper. HA: Data collection and analysis. MB, MG, AM, JH, WK, and MM: Data acquisition and analysis.

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