



Recurrent respiratory papillomatosis in children

Treatment for this rare disorder may require repeat surgeries.

By Caitlin Volz Winn, MSN, RN, CPN

RECURRENT respiratory papillomatosis (RRP) is a rare disorder caused by the growth of wartlike, noncancerous tumors (papillomas) in the respiratory tract. Papillomas can develop anywhere along the respiratory tract but most often affect the larynx and the vocal cords. Less often, the tumors appear in the mouth, trachea, and bronchi. Only in rare cases do these growths spread to the lungs. RRP can affect children or adults and is caused by human papillomavirus (HPV). (See *HPV and RRP*.)

Children who develop the disease earlier in life frequently have worse prognoses. They may have more papilloma growths, require

more frequent surgical interventions, and need a tracheotomy because of tracheal and pulmonary disease. Juvenile-onset RRP is typically more aggressive than adult-onset, most likely because of children's smaller airway anatomy.

Papillomas tend to grow back after they've been removed, requiring repeated surgeries. These multiple procedures may negatively affect the quality of life of children and their families. Although benign, papillomas can cause severe, even life-threatening airway obstruction and respiratory complications.

Transmission

Those at the greatest risk for devel-

oping juvenile-onset RRP include firstborn children delivered vaginally to mothers under 20 years old with active condyloma (genital warts) during pregnancy. Adult-onset RRP is thought to be associated with sexual transmission. No evidence exists to show that RRP is transmitted through casual contact. It can't be passed from child to child through playing or utensil sharing. Some research estimates that, over time, new cases of RRP will be prevented with the use of HPV vaccination.

Beyond the noted risk factors, little is known about why certain individuals develop RRP and others don't. Approximately 5% of the U.S. population may have HPV in

their respiratory tract, but fewer than one in 1,000 of those infected ever develop RRP. This is most likely related to a subtle immunologic deficiency affecting the respiratory tracts of those who develop the condition. Juvenile-onset RRP, which occurs in both boys and girls, is typically diagnosed by age 5.

Presentation

The most common symptoms of RRP include chronic voice weakness, strain, hoarseness, decreased pitch, stridor, and respiratory distress. When lesions form near the vocal folds, hoarseness can occur quickly even with small lesions. Additional RRP symptoms—chronic cough, episodes of choking, recurrent pneumonia, failure to thrive, shortness of breath, difficulty swallowing, and snoring—may be mistaken for other conditions including croup, bronchitis, and vocal cord nodules. Young children often experience a weak cry, chronic cough, swallowing difficulties, and stridor. Stridor is a sign of an upper respiratory obstruction and warrants immediate attention by an ear, nose, and throat (ENT) specialist.

RRP symptoms may develop gradually over months or even years in mild cases, but it may emerge in a matter of days in very aggressive cases. The average time from symptom onset to diagnosis ranges from 1 to 8 years.

Diagnosis

Diagnostic evaluation of RRP includes an examination of the larynx or vocal cords by an ENT specialist. Assessment techniques include mirror examination of the vocal cords; laryngoscopy and videostroboscopy provide more detailed visualization. The definitive RRP diagnostic tool is direct laryngoscopy with surgical removal of papilloma growths for biopsy and HPV testing. This procedure is performed in the operating room with general anesthesia.



HPV and RRP

Human papillomavirus (HPV) is the most common sexually transmitted infection. According to the Centers for Disease Control and Prevention, about 79 million Americans are infected with HPV, and about 14 million become newly infected each year. Most sexually active individuals will get at least one type of HPV during their lifetimes.

Recurring respiratory papillomatosis (RRP) is estimated to affect about four of every 100,000 children and about two of every 100,000 adults. HPV subtypes 6 and 11, although categorized as low-risk and typically not associated with malignancy, appear to be associated with airway obstruction and lung involvement.

HPV prevention

Gardasil is a quadrivalent vaccine that provides protection against HPV 6, 11, 16, and 18 and is recommended for boys and girls between ages 11 and 12 years. The vaccine decreases the spread and incidence of HPV. Because infants and young children can't be directly protected, vaccination of their mothers during childhood and young adulthood may provide indirect protection.

Source: Centers for Disease Control and Prevention 2017

Treatment

RRP treatment goals include papilloma reduction, airway patency restoration, symptom improvement, disease spread prevention, and decreased hospitalizations.

With no definitive curative treatment for RRP, surgery is the most used option. Typically, surgery is performed with lasers to debulk the lesions. However, complications such as respiratory tract burns, severe laryngeal scarring, and stenosis have occurred with laser therapy. Recently, a technique using microdebriders has been adopted. This technique more selectively suctions the affected tissue, allow-

ing for more precise debridement and decreasing damage to underlying tissues.

Surgical removal must be done as often as necessary to ensure an unobstructed airway. Surgery may be required anywhere from twice a month to once every 1 to 2 years. Despite more advanced surgical equipment, patients may still experience significant airway complications and require further management, such as a tracheostomy. Tracheostomies are used to bypass the obstructions of aggressive papilloma growth. Although a tracheostomy may be unavoidable in severe cases, decannulation should be con-

Medical therapy options

Several medical therapies are useful in the management of recurrent respiratory papillomatosis (RRP).

- **Hormonal treatments**, such as indole-3-carbinol/diindolylmethane, change the tissue environment to make it unfavorable for RRP growth. These treatments are given by mouth
- **Antiviral agents**, such as cidofovir, alter the viral infection. They can be administered intralesionally or intravenously, or through inhalation.
- **Immunotherapeutic medications**, such as interferon alpha, enhance the body's immune system to fight the infection. They can be administered intramuscularly, subcutaneously, intralesionally, or intravenously.
- **Anti-tumor agents**, such as photodynamic therapy, eliminate rapidly growing viral tumor cells. Photosensitizing dye is administered orally or intravenously and a specific wavelength of light is used to kill the viral cells.
- Bevacizumab, a **monoclonal antibody**, is a newer treatment option for RRP that has shown promising results. It reduces tumor growth by preventing new blood vessels from forming in the papillomas and is given locally as an intralesional injection or systemically through an I.V. infusion. Literature reviews show bevacizumab is a good agent for pediatric RRP adjuvant therapy, decreasing the number of surgical procedures per year and increasing time between procedures.

sidered as early as possible. Tracheostomies provide an additional site for papilloma growth and serve as a channel for disease spread to the lungs.

When RRP continues to occur even after repeated surgical debridements, or when it spreads to the lungs, additional medication therapy may be needed. Unfortunately, no single treatment has been found to be effective in treating all patients; providers frequently try several different drugs before finding one that reduces disease severity. Medical therapy is an attractive treatment option for children with aggressive RRP, but limited data exist about optimal dosage, effectiveness, and adverse effects.

Collaboration and communication between individual patients and providers is essential to determine treatment goals, choose the best treatment options, and manage side effects. The goal of current medical therapies is to reduce or eliminate the need for future surgeries. (See *Medical therapy options*.)

Nursing Implications

The care provided to children with

Accurate vital signs and a full respiratory assessment are critical tools for monitoring and identifying respiratory distress.

RRP is multidisciplinary, with nurses at the forefront. Nursing care begins with identifying key RRP assessment findings, such as chronic coughing, choking, voice weakness, strain, hoarseness, stridor, and respiratory distress. In addition, note any changes from the patient's previous presentation. Accurate vital signs and a full respiratory assessment—including pulse oximetry, breath sounds, and rate and rhythm—are critical tools for monitoring and identifying respiratory distress. Monitor your patient's nutritional goals and potential deficits based on growth parameters and intake. In addition, be aware of the potential psychosocial impact the diagnosis and treatments can have

on the patient and family; determine whether you need to make a referral to a therapist, social worker, or community-based program.

Future promise

Current treatment for juvenile-onset RRP focuses on surgical removal of tumors, which may have to be repeated as often as twice a month. The effect on the young patients and their families can lead to diminished quality of life. Increased HPV vaccination may help to reduce the number of children who acquire RRP during birth, and other treatment strategies under investigation hold promise that improved therapies to treat or prevent RRP will be available in the future. ★

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Selected references

- Carifi M, Napolitano D, Morandi M, Dall'Olio D. Recurrent respiratory papillomatosis: Current and future perspectives. *Ther Clin Risk Manag*. 2015;11:731-8.
- Centers for Disease Control and Prevention. Manual for the surveillance of vaccine-preventable diseases: Chapter 5: Human papillomavirus (HPV). November 10, 2017. cdc.gov/vaccines/pubs/surv-manual/chpt05-hpv.html
- Fusconi M, Grasso M, Greco A, et al. Recurrent respiratory papillomatosis by HPV: Review of the literature and update on the use of cidofovir. *Acta Otorhinolaryngol Ital*. 2014;34(6):375-81.
- Maturo SC, Hartnick CJ. Juvenile-onset recurrent respiratory papillomatosis. *Adv Otorhinolaryngol*. 2012;73:105-8.
- Rogers DJ, Ojha S, Maurer R, Hartnick CJ. Use of adjuvant intralesional bevacizumab for aggressive respiratory papillomatosis in children. *JAMA Otolaryngol Head Neck Surg*. 2013;139(5):496-501.
- Wilcox LJ, Hull BP, Baldassari CM, Derkay CS. Diagnosis and management of recurrent respiratory papillomatosis. *Pediatr Infect Dis J*. 2014;33(12):1283-4.
- Voice Foundation, The. Recurrent respiratory papillomatosis. voicefoundation.org/health-science/voice-disorders/voice-disorders/recurrent-respiratory-papillomatosis/understanding-rrp