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Balloon laryngoplasty in children with acute subglottic stenosis: experience of a tertiary-care hospital

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Abstract

Management of subglottic stenosis (SGS) in children is still a challenge to Otorhinolaryngologists. Balloon laryngoplasty (BLP) is an endoscopic procedure, first described in 1984 for the treatment of airway stenosis. It shows promising results and seems to be more effective than other procedures.

Aim: To present our experience with BLP in children with SGS.

Material and Method: Prospective study of children diagnosed with acute subglottic stenosis ,i.e., stenosis with granulation tissue. They underwent direct laryngoscopy under general anesthesia and dilatation of the stenotic segment with angioplasty balloon. They were followed up and a second laryngoscopy was performed one week later.

Results: Eight children were included in this study between June 2009 and October 2010. Four had Grade 3 SGS, three had Grade 2 SGS and one had Grade 1 SGS. By the second examination, two children presented with asymptomatic Grade 1 SGS, while the other six presented with normal airway and remained asymptomatic.

Conclusion: BLP seems to be an effective treatment for acute SGS. We need more studies to refine our knowledge concerning efficacy rates, safety and indications for balloon dilatation.

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INTRODUCTION

Starting in the 1950's, prolonged endotracheal intubation (ETI) started to play an important role in the management of respiratory disorders in critically ill adults and children, and it became the main cause of laryngeal stenosis. Subglottic stenosis seems to be more common in children, because this is the narrowest region in the airway of people at this age range[1].

The treatment of subglottic stenosis (SGS) in children continue to be a challenge for otorhinolaryngologists, and numerous open and endoscopic surgical techniques have been reported. Endoscopic techniques have the advantage of being less invasive and not leaving external scars; however, with variable success rates.

Among the endoscopic options for treatment, we found the CO2 or *yag laser* being used to resect the stenosis and dilatation using dilatation rods and stiff bronchoscopes and; more recently, angioplasty balloons.

The balloon laryngoplasty (BLP) is an endoscopic procedure, first described in 1984[2], used to treat stenosis of the upper airways. Such technique is being used, since then, to treat stenosis secondary to prolonged intubation, re-stenosis after laryngotracheal reconstructions and after cricotracheal resections with end-to-end anastomosis, with promising results[3-5]. A large variety of balloons have already being tested, among them we have the Fogarty embolectomy catheter and a number of angioplasty balloons[2,6,7].

Dilatation may be carried out under direct visualization with laryngoscopy or bronchoscopy[7] or by fluoroscopic control[3,5]. The procedure is palliative in some cases (turning a Myer & Cotton[8] grade 3 SGS into a grade 2 or 1), and curative in others[9].

Since its first description in the literature, BLP has been tested in subglottic stenosis, usually in small series of patients, but mostly showing promising results.

Our goal is to discuss our experience with BLP in pediatric patients with SGS after intubation and its evolution.

PATIENTS AND METHODS

We included in the study eight pediatric patients diagnosed with post-intubation SGS grade 1-3 from Myer& Cotton[8] in evolution, that is, SGS with granulation tissue, within the time frame between June of 2009 and October of 2010. These patients were found by means of a cohort study carried out by our study group, in which we did a nasopharyngolaryngoscopy in all the patients after intubation in our Pediatric ICU, since 2005. After nasopharyngolaryngoscopy, these patients were followed up and, if they had changes in the exam or upper airway obstruction symptoms in the follow up, they were submitted to direct laryngoscopy and, if any change was detected, they were submitted to specific treatment.

This study was approved by the Ethics Committee of our institution, under protocol number 05-266.

Technique

First, we carried out a direct laryngoscopy in order to diagnose and grade the SGS, using pediatric laryngoscopes and a scope of 0 degree and 4mm in diameter. The patient was sedated and remained in spontaneous ventilation during the procedure, receiving complementary oxygen through a nasal catheter. After the diagnosis and indication of balloon dilatation (acute stenosis in evolution, with granulation tissue, lower than grade 4), we introduced the balloon (angioplasty catheter - 4cm long and 10-14mm in diameter - Figure 1) through the laryngoscope, under direct view. The balloon was placed in the subglottis (Figure 2) and inflated with saline solution to a pressure of 2atm. The balloon remained inflated for 30 seconds and 2 minutes, and afterwards it was emptied and removed from the airway.

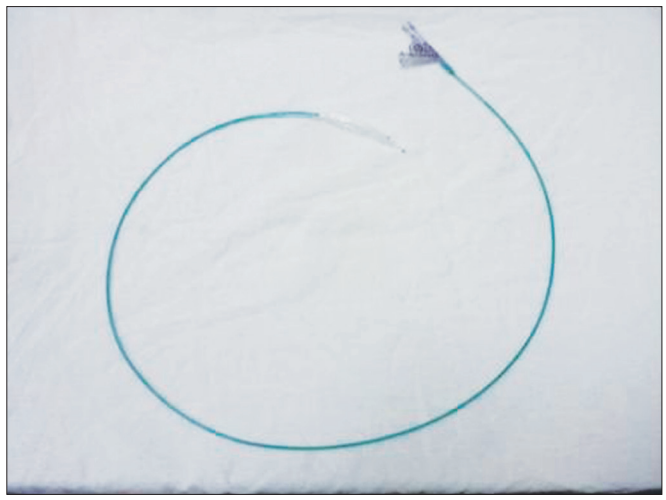

Figure 1. Angioplasty catheter used in the balloon laryngoplasty.

We then looked at the subglottis in order to see the immediate result. Should it be satisfactory, we removed the laryngoscope and the patient was awaken. Should the airway diameter be still not enough for a proper ventilation, the dilatation procedure was repeated. If after the second dilatation the airway was still not adequately dilated, the patient was referred to another type of treatment. The patient remained in oral steroids for 7 days after the procedure and had to take omeprazole for an indefinite period of time, until complete disease resolution. A new direct laryngoscopy was carried out to review the subglottis, 7 days after the dilatation procedure, and again whenever the