

Simple keel fixation technique for endoscopic repair of anterior glottic stenosis

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Abstract

The use of keels in the treatment of anterior glottic stenosis is well established. A variety of methods for keel fixation have previously been documented. We describe a simple technique of securing a Silastic keel, placed endoscopically, with a simple percutaneous suture, after laser vaporization of an anterior commissure web.

Key words: Stents; Larynx; Constriction, Pathologic

Introduction

A laryngeal web consists of a bridge of scar tissue covered by epithelium between the vocal folds. Laryngeal webs can vary considerably in length, width and thickness. Webs of the glottis are categorized as anterior, posterior and complete.¹ The symptoms associated with these webs include dysphonia, dyspnoea and stridor. However, anterior webs less than 2–3 mm in extent are often asymptomatic and do not require treatment.

The repair of anterior glottic webs represents a challenge to laryngologists. Many surgical techniques have been employed to solve the problem, with varying success. The use of keels in the treatment of these webs is now well established.

We describe a simple technique for securing a Silastic keel, placed endoscopically, with a single percutaneous suture, after laser vaporization of an anterior glottic web.

Technique

We performed the procedure under general anaesthesia using infra-glottic jet ventilation administered by a Hunsaker catheter (Xomed, Jacksonville, Florida, USA). Micro-laryngoscopy was performed to assess the airway and the extent of glottic stenosis. The endoscope was then suspended within the larynx and the web vaporized up to the anterior commissure using a carbon dioxide laser (Sharplan 40C, Sharplan, London, UK) under microscopic control (Figure 1).

To prevent restenosis, a keel was inserted (Figure 2). This consisted of a reinforced Silastic sheet which could be easily modified in height and posterior extent with scissors to suit the individual patient. The keel was trimmed such that the cranial edge extended 3–4 mm above the glottis and the caudal edge extended 6–7 mm into the subglottis. This allowed for a single fixation suture to pass through the keel below the level of the vocal folds. The posterior limit was determined by cutting the keel to the minimum length required to prevent apposition along the de-epithelialized vocal folds.

The correctly sized keel was then positioned firmly against the anterior commissure using laryngeal forceps (Figure 3). To secure the keel, a single 2/0 prolene suture on a straight needle was passed percutaneously through the crico-thyroid membrane on the right into the airway, where it could be seen endoscopically. The needle was then advanced through the keel inferior to the vocal folds and made to exit through the left side of the crico-thyroid membrane and skin. The prolene was then secured on the skin surface with beads and crushed metal clips (Figure 4). This provided not only permanent fixation but also a means to adjust the tension of the suture.

The keel was left in situ for two weeks until re-epithelialization had occurred and the patient was returned to theatre for repeat microlaryngoscopy. The prolene suture was then cut externally and the keel removed with laryngeal forceps.

Case report

A 67-year-old woman presented in 2000 with a 14-month history of dysphonia. Examination of the vocal folds revealed leukoplakia and subsequent biopsy showed squamous cell carcinoma in situ (LIN3). This was treated in 2001 by radical radiotherapy.

Over the subsequent 12 months, the patient developed dyspnoea on exertion and hoarseness. Laryngoscopy revealed a web occupying the anterior third of the larynx. This was treated with laser division on two occasions. Unfortunately, the patient's symptoms returned each time and repeat laryngoscopy confirmed recurrence of the web, this time involving over one-third of the vocal folds (Figure 1).

In March 2004, the web was vaporized again and a Silastic keel inserted for two weeks using the method described (Figures 2–4). At the six-week follow up, there was no evidence of restenosis (Figure 5). The patient now had a well defined anterior commissure, with good voice and airway, and remained without further web formation for six months.

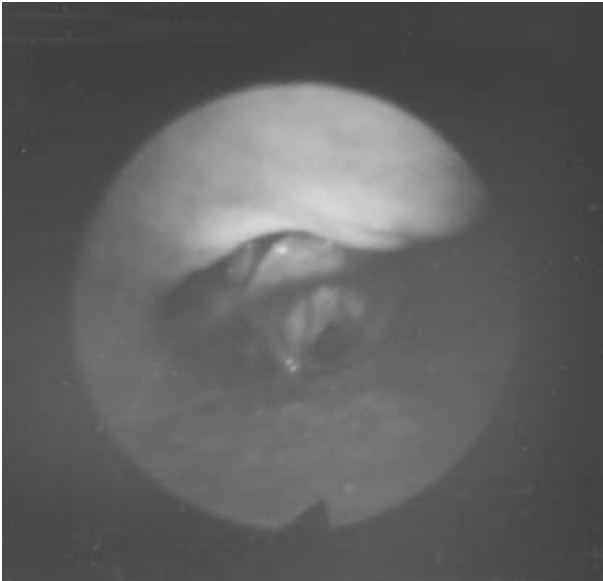


FIG. 1

Pre-operative view shows an anterior commissure web.

Discussion

Web division followed by repeated dilation of the laryngeal inlet by bouginage was described early in the last century.²⁻⁴ This technique was later abandoned owing to the high rate of scar formation and restenosis.

It was subsequently accepted that successful treatment of webs rested upon a two-stage technique. This involved web lysis followed by a secondary step allowing re-epithelialization of the vocal folds without restenosis. In order for the latter to take place, the raw mucosal surfaces must be kept apart until healing has occurred. Many ingenious surgical techniques have been documented over the years in order to accomplish this.

In 1950, McNaught⁵ described a method of using a transglottic tantalum keel anchored between the vocal folds.

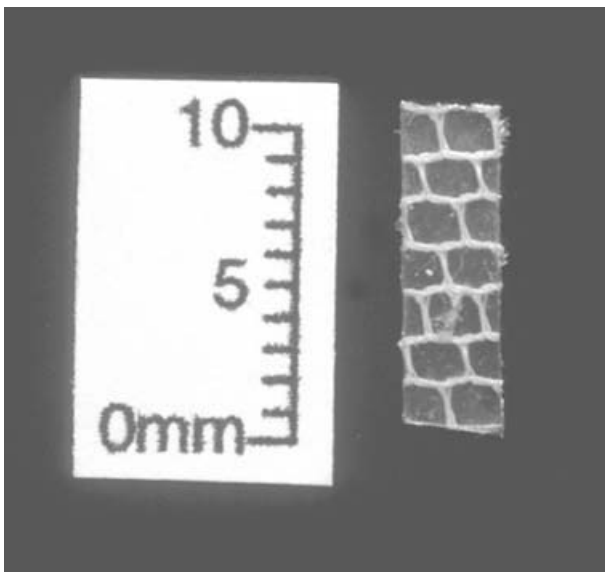


FIG. 2

The Silastic keel used in the operation.

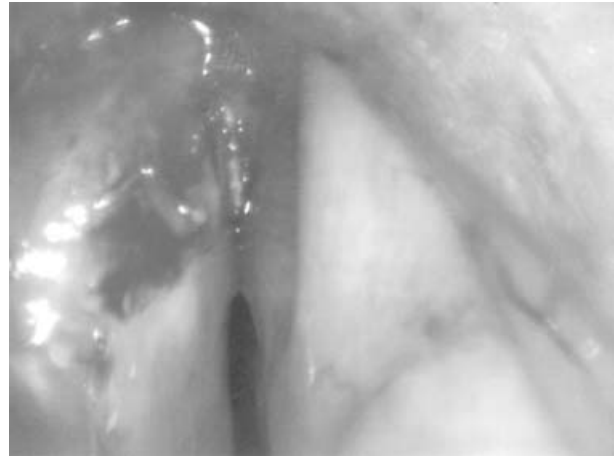


FIG. 3

The Silastic keel in position.

The disadvantage of this method was that it required a tracheostomy and repeated opening of the laryngofissure for keel installation and removal. The search for less invasive surgical methods of keel placement, which reduced post-operative morbidity and recovery time, was pioneered by Haslinger⁶ and Iglauer.⁷

Haslinger and Iglauer described endoscopic methods of inserting keels made from a silver plate and a spring ring from a watch chain, respectively. Subsequently, others have modified the method of placing keels via an endoscopic approach.⁸⁻¹⁴ Keels constructed with newer materials such as Teflon and Silastic have now replaced metal keels. Affixing these keels, however, has not always been easy or efficient.

The simplicity of our approach for securing the keel compares favourably with other endoscopic methods. A number of previously documented techniques employed multiple punctures through the larynx with various devices, including an intravenous cannula,¹² spinal needles¹³ and hypodermic needles,¹⁴ through which the suture material was introduced.

Our technique involves a single, translaryngeal suture passed using prolene thread on a straight needle. This minimizes tissue trauma and, if placed carefully, the single suture provides enough anchorage to prevent the keel



FIG. 4

Skin surface over the larynx, showing external fixation method.

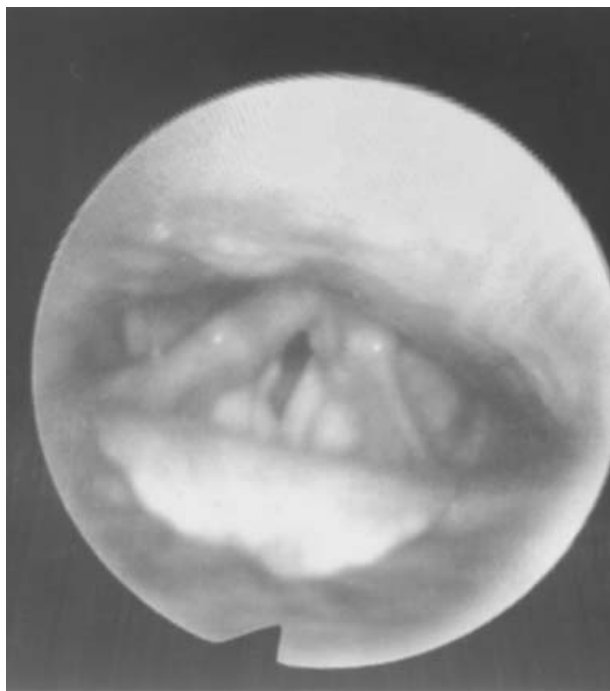


FIG. 5

Six weeks post-operatively, the vocal folds have re-epithelialized and the keel has been removed endoscopically.

from rotating or slipping out of position, as the above case demonstrates.

The reinforced Silastic sheeting used to make the keel has several advantages: its tissue compatibility; its ability to prevent the fixation suture from tearing through the keel; and its flexibility, avoiding pressure necrosis.

Owing to the materials used and the method of fixation, the keel was well tolerated by our patient, who also had reasonable speech and no impairment in swallowing during its insertion. In addition, a tracheostomy was not required.

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