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**Key Words:** subglottic stenosis, laryngotracheal resection, idiopathic stenosis

## Discussion

### Presenter: Dr Giulio Maurizi



**Dr Joel D. Cooper** (*Philadelphia, Pa*).

I thank the Association for the chance to participate in this historic session. I also want to congratulate the authors on their excellent results in a large series dealing with a very difficult problem. First, I would like to send my best wishes to the authors, some of

whom are close personal friends, and to the entire country of Italy for the terrible tribulation and losses they have sustained, and express my great admiration, which I think is shared by the entire world, for the dedication, sacrifice, and commitment shown by the medical community and allied staff in fighting this pandemic. I wish you all a speedy return to some degree of normality.

Regarding the operative results, 2 quick questions. You mentioned that there was no perioperative mortality. Was there any 30- or 90-day mortality relating to the operation?



**Dr Giulio Maurizi** (*Rome, Italy*).

Thank you for your comments and questions. It is a great honor to have the opportunity to present this paper to the American Association for Thoracic Surgery, and it is a great honor to have you as discussant.

When we are talking about mortality, we refer to in-hospital mortality. Moreover, no patients died after day 30 and during the follow-up except for 4 patients who died due to other disease.

**Dr Cooper.** Thank you. These are indeed excellent results. The second question relates to recurrent nerve palsy, which is always a big concern when dealing with the subglottic airway. Did you have a significant incidence of either temporary or permanent recurrent nerve palsies in these patients?

**Dr Maurizi.** Thank you. We reported excellent result (early and definitive) in this series in more than 80% of patients. Except for patients who experienced airway complications and failure, the others showed minor sequelae like

changes that did not jeopardize the success of the operation. Among these patients, 2 patients who underwent surgery in the past study period presented with abnormal voice and reduced mobility of 1 of the vocal cords, which progressively improved in 1 case spontaneously, and in the other case, after 2 months of steroid therapy. Maybe the Pearson technique principles for recurrent nerve preservation helped us.

**Dr Cooper.** That indeed makes it a very outstanding series, because that's among the very important aspects of your report. As far as the operation is concerned, you employ the suprahyoid release, as described by Montgomery, rather conservatively. I must say that in recent years, I've started using it more liberally. Once you've done it a couple of times, it takes no time at all, and it's not associated with any particular problem. It makes the anastomosis easier, and safer by reducing tension in many patients and we have used it maybe as much as 15% to 20% of the time, sometimes even doing it before we've done the actual resection if we anticipate a problem with tension.

You also mentioned the importance of intraoperative and postoperative care. I also wanted to emphasize—and get your thoughts on—temporizing. I believe that among the most important things you can do to ensure a good result is to not rush the repair. These patients have often experienced trauma, serious medical issues, and prolonged hospital stays, and if possible it is best to allow them to recover as completely as possible before embarking on the airway resection. Among the most practical ways of maintaining a satisfactory airway is to stent the narrowed segment with the use of a silicone T-tube, especially if the patient already has a tracheostomy tube in place. The T-tube doesn't migrate or cause further damage that otherwise can result from repeated dilatation, laser treatments, or the use of an expandable metallic stent. Do you have any comments on that?

**Dr Maurizi.** That is a very important point and a good suggestion. We had 190 patients presenting with postintubation stenosis and 83 patients underwent tracheostomy elsewhere before surgical resection. Tracheostomy is among the options before resection, like a T-tube, to temporize. To clarify, tracheostomy may have been done for the stenosis, or may have been the cause of the subglottic stenosis. Because in 25 of these patients tracheostomy was performed as an emergency procedure due to critical subglottic stenosis, we might conclude that in the majority of the remaining patients a too-high tracheostomy is performed because prolonged intubation was likely to be the cause of a laryngotracheal stenosis.

**Dr Cooper.** How often did these patients have a tracheostomy tube in place at the time of surgery?

**Dr Maurizi.** They experimented tracheostomy elsewhere before resection. This can be misleading: Tracheostomy could have been the cause of the stenosis or could

have been a treatment to bypass the problem before resection. Sometimes, patients had tracheostomy at surgery, but it's very difficult to tell if a previous tracheostomy was cause or treatment.

**Dr Cooper.** I understand that it is a difficult problem. If a patient has a tracheostomy tube in place to provide a safe airway, he or she will be much more willing to postpone the airway resection because they have their voice, can breathe fairly normally, and have much less of a daily maintenance problem. When the airway resection is scheduled, you can often remove the T-tube a few weeks before the surgery and let the whole neck heal up so you don't have an open wound at the time of the resection. Furthermore, the site of the previous tracheostomy stoma can sometimes be preserved, reducing the length of the resection required.

You mentioned that at the end of the operation you put in an uncuffed nasotracheal tube, which you leave in for a day or so. What we've done is after the anastomosis is completed but before we've closed the subcutaneous tissue and skin, we ask the anesthetist to start waking up the patient and replace the endotracheal tube with a laryngeal mask (which you referred to). We then insert a bronchoscope through the mask, clean out the airway, and park the bronchoscope above the vocal cords. When the patient is awake and can phonate, we test the vocal cord function and inspect the anastomosis. If the anastomosis is fine, we don't do anything further; we just close the subcutaneous tissue and skin. If we have any concern (maybe 10% of the time), we'll put in a small, #4 uncuffed minitrach tube through a stab incision in the trachea just below the suture line. We then close the rest of the wound and leave the minitrach in place for a few days.

Regarding prevention, in recent years we have been seeing an increasing number of postintubation subglottic strictures, whereas previously the most common cause of stenosis in the subglottic region was so-called idiopathic subglottic stenosis.

I believe there are at least 2 preventable causes of these postintubation strictures. One results from a high tracheostomy site positioned, perhaps inadvertently, too close to the cricoid. As you mentioned, this can result in damage to the cricoid, with a resulting infection and a subglottic stricture that can be, in fact, even complete obliteration not noticed until the tracheostomy tube is being removed and they fail the extubation.

Another cause may result from endotracheal intubation in very urgent circumstances (in the field or in the emergency ward), when the patient is rushed to the operating room, or to the computed tomography scanner, and no one notices that the cuff is in the subglottic region. You can see it in retrospect in these patients on their chest radiograph or computed tomography scan, but it isn't noticed at

first. If the cuff remains at the level of the cricoid for just a few days, permanent damage may result in the type of subglottic stenosis you have described. I wish they had radio-opaque cuffs so that the malpositioning of the T-tube could be more easily recognized. I'm wondering if you have experienced these 2 potentially preventable causes in your series?

**Dr Maurizi.** The cause of the stenosis, the etiology of a postintubation stenosis remains the main problem with benign subglottic stenosis. Moreover, the problem is not only the cuff, but also the decubitus of the endotracheal tube. So, the combination of these factors (the decubitus of the endotracheal tube, the cuff under the glottis, and a too high tracheostomy) remains a very big problem, causing a very high number of stenoses.

The decubitus of the tube can often cause a lot of fibrosis in the posterior portion of the cricoid: This is an additional problem in particular when performing resection and you have to pay attention. Sometimes you have to remove fibrotic tissue from the cricoid plate. I think the etiology is a combination of different problems. Postintubation airway disease is a big theme, in which we can find tracheostomy, the decubitus of the endotracheal tube, and the cuff as the origin of the problem.

**Dr Cooper.** Congratulations again. It's a wonderful series. It's not just of importance to a relatively small number of surgeons who have a particular interest in this type of problem, but also to a larger number of interventional pulmonologists to whom such patients may be initially referred. By demonstrating the good results that you have obtained, those who persist in trying to treat these strictures with methods such as expandable wired stents, multiple laser, and dilatations, without realizing what is possible from a surgical standpoint, can create more damage and make a much more complicated situation out of it. What advice do you have for interventional pulmonologists or other critical care doctors who might initially discover a subglottic stenosis?

**Dr Maurizi.** I completely agree. Conservative treatment is a very good option for patients, but sometimes repeated endotracheal treatments (eg, laser and mechanical dilatation) can make the resection more difficult. So my advice is: When the stenosis is suitable for resection with good or excellent results, it's very important to consider resection as not the first option, but rather the second option. No many endoscopic treatments and so on. If we have a problem with healing and other airway problems, we usually perform endoscopic treatment within our division (in-house), not with outside pulmonology or other interference from outside our institution. This could be an advantage for the surgeon and for the patient.