

BRIEF COMMUNICATION

“The Neocricoid”: A New Surgical Technique to Prevent and Treat Tracheostomal Stenosis after Total Infracricoid Laryngectomy[☆]

Pedro Lázaro de Frutos

Consulta del Dr. Lázaro de Frutos, Servicio de Otorrinolaringología, Hospital Gregorio Marañón, Madrid, Spain

Received 15 January 2010; accepted 17 June 2010

KEYWORDS

Neocricoid;
Stenosis;
Tracheostoma;
Surgical technique

PALABRAS CLAVE

Neocricoides;
Estenosis;
Traqueostoma;
Técnica quirúrgica

Abstract The goal is to present a new surgical technique that may solve and prevent tracheostomal stenosis after total infracricoid laryngectomy.

The concepts on which the technique is based are explained and the technique as performed is described. The complete success achieved in three clinical cases treated with this technique is also presented.

© 2010 Elsevier España, S.L. All rights reserved.

“El neocricoides”. Una nueva técnica quirúrgica para prevenir y tratar las estenosis del traqueostoma postlaringectomía total infracricoidea

Resumen El objetivo es presentar una técnica quirúrgica novedosa, para prevenir y tratar las estenosis del traqueostoma postlaringectomía total infracricoidea.

Se explican los conceptos en los que se basa, se describe la técnica tal como se realiza y se presentan tres pacientes tratados con ella y su resultado.

© 2010 Elsevier España, S.L. Todos los derechos reservados.

Introduction

Stenosis of the tracheostoma after total infracricoid laryngectomy is a complication that has affected this surgery since its revision by Gluck-Soerensen and Garcia-Tapia, who contributed to its improvement with their amendments. Their communications¹ explain the existence of such complications and the means used to avoid them.

The incidence of stenosis varies according to the authors consulted. It ranges between 0%, 6%, 42%, and 75%,^{1–4} depending on the criterion used to determine the existence of stenosis and the use of the cannula.

Wax et al.² believes there is stenosis when the patient must still use the cannula 3 months after laryngectomy. Its incidence is 33% for the bevel section and 75% for the circular section of the trachea.

For the author, stenosis exists when the ostomy does not provide the necessary oxygenation. Its incidence was 0.03% (3 patients).

The existence of stenosis has been attributed to many causes: poor surgical technique in the performance of the stoma, infection, excess skin and fat, radiation,^{1–4} tracheo-oesophageal punctures^{2,4} and weakness of the tracheal cartilage.

[☆] Please cite this article as: Lázaro de Frutos P. “El neocricoides”. Una nueva técnica quirúrgica para prevenir y tratar las estenosis del traqueostoma postlaringectomía total infracricoidea. Acta Otorrinolaringol Esp. 2011;62:228–30.

E-mail address: plfrutos@yahoo.es

Table 1 Characteristics of Patients Included in This Study.

| Patient | Age/Gender | Location of Tumour | TNM | Initial Treatment | Time Until Stenosis | Treatment of Stenosis | Result | Follow-up |
|---------|------------|----------------------|--------|-----------------------|---------------------|-----------------------|--------|-----------|
| 1 | 59/male | Right piriform sinus | T4N3M0 | TL+R RND+L FND | 20 months | Neocricoid | Good | 17 years |
| 2 | 67/male | Right piriform sinus | T4N3M0 | TL+R RND+L FND+RT | 8 years | Neocricoid | Good | 3 years |
| 3 | 56/male | Right piriform sinus | T4N3M0 | TL+BFND+RT+neocricoid | | | Good | 6 months |

BFND, bilateral functional neck dissection; FND, functional neck dissection; L, left; R, right; RND, radical neck dissection; RT, radiotherapy; TL, total laryngectomy.

There are two treatment options: expansion and use of the cannula to maintain the tracheal opening, with all its inconveniences,⁵ or surgical correction.

The various techniques proposed aim to increase the circumference of the stoma by oblique or bevelled cuts of the trachea, vertical incisions of the tracheal rings, suture lines in a saw pattern, interdigitating flaps, plastic surgery in Z-, V- or Y-shapes,^{1-3,6-8} etc. Disadvantages: some are very complicated and all involve a percentage of failures.

The technique developed by the author is based on the observation that stenosis of the tracheostoma does not take place in supracricoid laryngotomies, while infracricoid ones do generate stenosis. In this case, it is necessary to use the cannula for a certain period of time or permanently. Consequently, if a surgical technique manages to create a ring similar to the cricoid (a neocricoid), an infracricoid laryngectomy would become supracricoid, thus eliminating the possibility of stenosis.

This technique is intended to create a ring that is similar to the cricoid, strong and resistant to pressure, in the top of the trachea. If done during a laryngectomy, it is part of the tracheostoma construction time of the operation. If performed as a treatment for stenosis of the tracheostoma, it is a simple reconstruction.

Clinical Cases

This technique was performed in 3 patients who underwent total infracricoid laryngectomy, due to pyriform sinus carcinoma. Some time after the laryngectomy, cases 1 and 2 developed a stenosis of the tracheostoma, due to abandoning the use of the cannula for different reasons, which were solved by the technique presented. In case 3, the laryngectomy performed was completed using this technique.

Table 1 shows the characteristics of the 3 patients treated with the technique described below.

Surgical Technique

The procedure was performed under general anaesthesia. It can also be carried out under local anaesthesia in the stenosis.

First step: (only for stenosis) the scar skin ring bordering the stoma is removed, leaving the top of the trachea completely free (Fig. 1, 1st image).

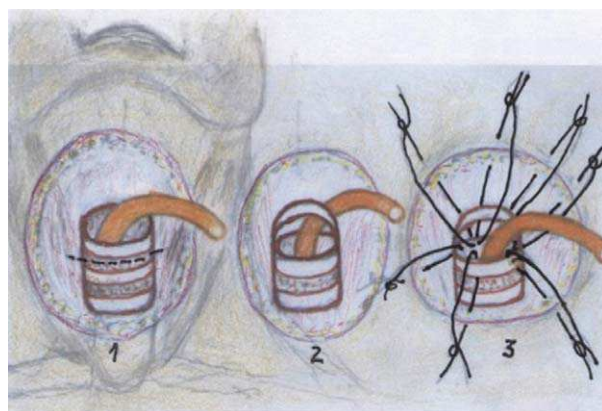


Figure 1 Schematic of the technique.

Second step: (both for cases of stenosis and as part of the laryngectomy process): the intercartilaginous sheet is sectioned with a scalpel blade, up to the membranous part of the first tracheal ring that, although freed, remains attached to the trachea by its posterior end (Fig. 1, 2nd image). The front tube is removed temporarily, while the ring is rotated 180° backwards, and then replaced in the front part.

Third step: this consists of suturing the skin of the neck, once free of scar tissue, to the circumferential edge of the trachea, including the rotated cartilage half-ring within the posterior part of this suture (Fig. 1, 3rd image). We consequently obtain a cartilage ring formed at its front by the second tracheal ring and at the back by the rotated first ring, with a rigid and strong consistency, similar to the cricoid.

Results

The 3 patients retain a tracheostoma with a larger diameter than that of their trachea, circular, with no restenosis or other complications, without needing a cannula since their discharge. The two rings used are clearly visible, the anterior with a perfect edge, reinforced by its supports below, and the posterior somewhat deformed by the pressure endured, being alone (Fig. 2).

Discussion

The large number of publications produced (1740 in *The Laryngoscope*) for the treatment of stenosis of the



Figure 2 State of the tracheostoma, 14 years after the operation.

tracheostoma after laryngectomy is surprising. Furthermore, some treatments have subsequently been used as a preventive technique for stenosis.^{1-4,6-9} According to Giacomarra in 2001, "the wide variety of techniques proposed shows how difficult is it to find a solution for the problem"³ as they all have a certain percentage of failures. The author believes that they are based on the work of Montgomery in 1962, who classified stenoses into 3 groups: vertical slit, concentric stenosis and lower shell. For each he offered a different type of surgery: vertical incisions of the rings, widening of the circumference of the stoma, flaps, etc. All acted on the edge of the tracheostoma, attempting to create forces that fixed this edge and moved it outwards, thus counteracting the natural tendency towards stenosis.

The technique proposed by the author is innovative in creating a cartilage ring that is resistant to pressures at the top of the trachea, with a function and appearance reminiscent of the cricoid cartilage, consequently being known as neocricoid. In the literature reviewed, only Osmolski et al.⁹ present a similar alternative.

It is indicated only for the final closure and formation of the tracheostoma in total infracricoid laryngectomies and for the treatment of tracheostomal stenosis after laryngectomy.

It is easy to perform stenosis surgery, not to mention its use in laryngotomies, as it is carried out within a few seconds: the time taken to sever the intercartilaginous sheet and rotate the ring backwards. The operation then resumes its ordinary course of suturing the tracheostoma. No complications have arisen in the cases where it has been performed, but it may be affected by the same factors as any other laryngectomy: infection, chondritis and necrosis of the cartilage. Irrigation of the flap or tracheal ring does not represent a problem, because their nutritional beds are

well vascularized, as demonstrated in the 3 cases performed and those done with costal cartilage by other authors.⁹ Prior tracheostomy and radiotherapy have not affected the procedure.

Expectations regarding non-erygmophonic vocal rehabilitation techniques (near total, fistulas, and phonatory prosthesis) are unknown at the moment. The near total is not dependent on this technique. The same results are expected as those obtained with fistulas and phonatory prostheses carried out in total supracricoid laryngectomy. Since phonatory fistulae are among the causes of tracheostomal stenosis, this technique may help to eliminate this complication and fix the prosthesis in the fistula.

Conclusions

This tracheal cartilage rotation technique would be adequate to prevent and treat tracheostomal stenosis with good and permanent results. For new cases, it would be advisable to confirm whether it could become a routine technique in infracricoid laryngotomies, eliminating the use of the cannula and improving the quality of life of patients, which is the principal purpose.

Conflict of Interests

The authors have no conflicts of interest to declare.

References

1. García Tapia A. Antología. Tomo 2. C. Bermejo: Madrid; 1946. p. 265, 340-1.
2. Wax MK, Touma BJ, Ramadan HH. Management of tracheostomal stenosis. *Laryngoscope*. 1999;109:397-401.
3. Giacomarra V, Russolo M, Tirelli G, Bonini P. Surgical treatment of tracheostomal stenosis. *Laryngoscope*. 2001;111:1281-4.
4. Vlantis AC, Marres HA, van den Hoogen FJ. A surgical technique to prevent tracheostomal stenosis after laryngectomy. *Laryngoscope*. 1998;108:134-7.
5. Suryanarayan R, Mackinsson NA. Dilatation of tracheostomal stenosis using uterine dilators. *Clin Otolaryngol*. 2006;31:16.
6. Montgomery WW. Stenosis of tracheostoma. *Arch Otolaryngol*. 1962;75:76-9.
7. Trivedi NP, Patel D, Thankappan K, Iyer S, Kuriakose MA. Stomatoplasty-anterior advancement flap and lateral splaying of trachea, a simple and effective technique. *Postgrad Med*. 2008;54:21-4.
8. Kim YH, Kim NH, Seong SY, Hyun DW, Choi HS. Double reversing Z-plasty with inferiorly widening stomatoplasty for the management of tracheostomal stenosis. *Auris Nasus Larynx*. 2010;36:1-1361.
9. Osmolski A, Lazecka K, Adamiak G, Osmolski R, Bukrewicz M. Stomatoplasty for tracheostomal stenosis using rib cartilage: authors method. *Pol Merkuriusz Lekarski*. 2005;19:426-7.