

# Temporary tracheotomy in the surgical treatment of Obstructive Sleep Apnea Syndrome: personal experience

## *La tracheotomia temporanea in roncochirurgia: nostra esperienza*

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### Key words

Tracheotomy • Obstructive Sleep Apnea Syndrome (OSAS) • OSAS surgery

### Parole chiave

*Tracheotomia • Apnee Ostruttive del Sonno (OSAS) • Chirurgia dell'OSAS*

### Summary

Aim of the study is a retrospective analysis on the use of temporary tracheotomy in our snoring surgery experience. From September 1996 to April 2002, 1103 snoring surgery procedures have been carried out on various sites of the upper airways in 530 patients (mean age 50 years, 81% males) prevalently related to severe Obstructive Sleep Apnea Syndromes (33%). Of these patients, 472 (89%) were operated upon under general anaesthesia, whereas 58 (11%) received local anaesthesia. Of the 472 patients operated upon under general anaesthesia, 17 (3.6%) underwent temporary tracheotomy, which in 10 (2.1%) were programmed and only in 7 (1.5%) were non-programmed, having been performed in 2 cases in an emergency setting, in 3 cases in an urgency setting due to respiratory obstruction immediately after removal of intubation and in 2 cases in conditions of urgency, due to respiratory obstruction occurring during post-operative hospitalisation (both performed within 6 hours of regaining consciousness). The only complication observed was a brief laryngeal diplegia, a complication, moreover, not reported in the literature. No criteria exist concerning indications for temporary tracheotomy programmed according to the type of surgery on the hypopharynx; personal experience reveals that: a) temporary tracheotomy is frequently necessary after genioglossus advancement (3/10 operated upon for genioglossus advancement not associated with a programmed temporary tracheotomy); b) temporary tracheotomy is rarely necessary after hyoid suspension (1/98 patients being submitted to hyoid suspension not associated with programmed temporary tracheotomy). Temporary tracheotomy should, in our opinion, be taken into consideration in snoring surgery techniques, particularly in the presence of the not infrequent urgency or emergency situations occurring in patients with Obstructive Sleep Apnea Syndromes. With the use of temporary tracheotomy, no deaths occurred in the present study population.

### Introduction

Tracheotomy was first proposed by Kulho et al.<sup>1</sup> for definitive surgery in severe forms of obstructive sleep apnea syndrome (OSAS). Despite the exponential development of surgical solutions proposed for the treatment of OSAS, permanent tracheotomy is

### Riassunto

*Scopo dello studio è un'analisi retrospettiva sul ricorso alla tracheotomia temporanea nella nostra esperienza roncochirurgica. Da settembre 1996 ad aprile 2002 sono state eseguite 1103 procedure roncochirurgiche sui diversi siti delle vie aero-digestive superiori in 530 pazienti (età media 50 anni, sesso maschile 81%) in netta prevalenza OSAS e di grado grave o severo (33%). L'89% dei pazienti (472) è stato operato in anestesia generale, mentre l'11% (58) in anestesia locale. Su 472 pazienti operati in anestesia generale sono state eseguite 17 tracheotomia temporanea (3,6%), di cui 10 programmate (2,1%) e 7 non programmate (1,5%), eseguite in 2 casi in totale emergenza, in 3 casi in urgenza per ostruzione respiratoria immediata dopo estubazione ed in 2 casi in urgenza per ostruzione respiratoria sopraggiunta durante la degenza post-operatoria in reparto (entrambe eseguite entro le prime sei ore dal risveglio). L'unica complicanza riscontrata è stata una fugace diplegia laringea, complicanza peraltro mai segnalata in letteratura. Uno dei problemi non codificati appare quello delle indicazioni alla tracheotomia temporanea programmata secondo la tipologia degli interventi sul distretto ipofaringeo; la nostra esperienza insegna che: la tracheotomia temporanea è frequentemente necessaria dopo avanzamento genio-glossa (3 su 10 operati di avanzamento genio-glossa non associato a tracheotomia temporanea programmata, pari al 30%); la tracheotomia temporanea è eccezionalmente necessaria dopo sospensione ioidea (1 su 98 operati di sospensione ioidea non associata a tracheotomia temporanea programmata, pari a 1%). La tracheotomia temporanea deve a nostro avviso essere considerata tra le tecniche chirurgiche che il roncochirurgo deve possedere, soprattutto per le non rare situazioni di urgenza ed emergenza che si possono realizzare nei pazienti OSAS: è grazie alla tracheotomia temporanea che la mortalità della nostra casistica è pari a zero.*

still, today, the only irreplaceable tool in specific cases not amenable to other techniques<sup>2-4</sup> and the Skin-Lined technique is the most satisfying surgical procedure<sup>3,5,6</sup>.

Unlike permanent tracheotomy, temporary tracheotomy (TT) is not aimed at therapeutic resolution of OSAS, but may be mandatory to allow sufficient

ventilation either following or whilst awaiting surgery for snoring procedures.

Aim of the present study was a retrospective analysis on the personal use of TT in our personal experience on snoring surgery.

**Indications**

Conditions requiring a TT to ensure adequate ventilatory function occur:

- in the post-operative period in patients submitted to other surgery procedures for OSAS treatment;
- in cases of severe OSAS with life-threatening risks, not amenable to nasal-continuous positive air pressure (n-CPAP) and in which surgery for snoring needs to be postponed (due to treatment of obesity, endocrine disorders, cardio-vascular diseases, lung diseases, etc.);
- in severe paediatric OSAS patients associated with maxillo-facial syndrome-related malformations, requiring corrective surgery (cranio-facial skeletal augmentation with or without associated soft tissue reduction) <sup>7-9</sup>.

**Performance conditions**

TT, as in pharyngo-laryngeal oncologic surgery, may be programmed, together with other surgical procedures carried out for therapeutic purposes, in patients at risk of respiratory obstruction in the post-operative period.

Although the surgical technique of TT in surgery for snoring is the same as that usually employed <sup>10</sup>, in OSAS patients, due to adverse factors such as unfavourable anatomical conditions and a greater frequency of respiratory obstruction which is not always foreseeable, TT is not infrequently performed in conditions of urgency or emergency and not always in general anaesthesia.

The various conditions in which TT may be performed in the management of OSAS are shown in Table I.

**Materials and methods**

Retrospective analysis of the present study was carried out on the adult OSAS patients submitted to surgical procedures in the Otorhinolaryngology Department in Forlì.

From September 1996 to April 2002, 1103 rhinosurgical procedures have been performed in the various upper aero-digestive sites in 530 patients (mean age: 50 years (range: 26-78)), with a male predominance (81%) and with varying degrees of severity of OSAS:

- 48 (9%) Simple Snoring (SS);
- 58 (11%) Upper Airway Resistance Syndrome (UARS);
- 424 (80%) OSAS, of whom:
  - 79 (15%) slight [Respiratory Disturbance Index (RDI) 10-20]
  - 170 (32%) median (RDI 21-40)
  - 175 (33%) important (RDI 41-60) or severe (RDI >60).

**Table I.** Classification of TT related to conditions in which this procedure is performed.

**Programmed**

- Intra-operative in general anaesthesia
- Preliminary in local anaesthesia (in patient with intubation at high risk of failure)

**In conditions of urgency**

- Upon awakening from general anaesthesia  
(location: operating theatre during awakening)  
(event: ventilatory insufficiency following extubation → re-intubated)
- In post-operative period in general anaesthesia  
(location: ward)  
(event: ventilatory insufficiency → patient is re-intubated)

**In emergency**

- Impossible intubation not foreseen
- Upon awakening following extubation  
(location: operating theatre)  
(event: impossible re-intubation)
- In post-operative period (re-intubation failed when attempted)

**Table II.** TT performed in the present series of patients submitted to surgery for snoring.

<b>10</b>	<b>Programmed</b>
9	Intra-operative under general anaesthesia
1	Preliminary under local anaesthesia (in patient with intubation at very high risk of failure)
<b>5</b>	<b>Urgent treatment</b>
3	Upon awakening in general anaesthesia (location: operating theatre during awakening) (event: ventilatory insufficiency after extubation → re-intubated)
2	In post-operative period, under general anaesthesia (location: ward) (event: ventilatory insufficiency → patient is re-intubated)
<b>2</b>	<b>Emergency treatment</b>
2	Intubation impossible not programmed
0	Upon awakening following extubation (location: operating theatre) (event: impossible re-intubation)
0	In post-operative phase (re-intubation in vain when attempted)
17	TOTAL (3.6% of the 472 patients operated upon under general anaesthesia)

Of these patients, 472 (89%) have been operated upon under general anaesthesia, whereas 58 (11%) under local anaesthesia.

## Surgical technique

A traditional surgical procedure was used when performing TT<sup>10</sup>: horizontal cervicotomy, tracheotomy, preferably, but not necessarily, below thyroid isthmus, horizontal inter-cartilaginous tracheal incision possibly extended by means of partial median section of the ring above and below to achieve a tracheotomic opening, elliptic in shape, in order to reduce not only lateral traction on the horizontal tracheotomy but also tracheal angle due to the introduction of the tube.

Slight variations may be introduced depending upon the anatomical conditions of patient, the performance conditions (programmed vs. urgency vs. emergency) and performance by one surgeon only or by a surgical team.

## Results

A total of 17 (3.6%) TTs were performed in 472 patients operated upon under general anaesthesia. In 10 cases, TT was programmed according to the follow-

ing criteria: **a.** possible difficulty in intubation (with subsequent higher risk in the event of post-operative respiratory obstruction); **b.** severity of OSAS; **c.** multilevel surgery (associated, in some cases, with nasal treatment which would exclude use of nasal Continuous Positive Airway Pressure) and type of procedure: TT is mandatory in Chabolle procedure (tongue base reduction with hyoepiglottoplasty – TBRHE)<sup>11</sup> whilst TT is advisable if associated with genioglossus advancement and hyoid suspension.

The distribution of TTs performed according to the above-mentioned scheme (Table I) is outlined in Table II.

Of the 472 patients, non programmed TT was necessary in only 7 cases (1.5%), namely:

- 2 TTs performed in conditions of total emergency:
  - M.P. (40-year-old male, BMI 24, RDI 13), came to our observation on account of a recent snoring disorder, a giant hypopharyngeal cyst due to retention was found in the absence of other associated obstructive causes; the patient was immediately hospitalised for the surgical procedure – direct microlaryngoscopy – once under general anaesthesia, the anaesthetist found it impossible to intubate, as well as to adequately ventilate the patient (passive ventilation pushed the mass obliterating the laryngeal lumen);

- A.A. (63-year-old male, BMI 37, RDI 54), once general anaesthesia was induced, a non-programmed intubation was impossible and the patient, despite use of a Guedel tube and manual ventilation, remained hypoventilated for about three minutes whilst performing tracheotomy (no post-hypoxic sequela). This case referred to a patient in whom TT had been programmed in general anaesthesia associated with Chabolle TBRHE and in whom intubation was impossible particularly due to results of an atypical procedure of hyoid suspension, previously carried out elsewhere.
- 3 TTs performed in urgent conditions due to respiratory obstruction occurring after removal of intubation:
  - B.C. (42-year-old male, BMI 31, RDI 32) operated upon for UP3 and hyoid suspension;
  - M.M. (21-year-old male, with infantile cerebral paralysis, BMI 18, RDI 23) operated upon for epiglottopexy;
  - D.P.M. (41-year-old male, BMI 26.3, RDI 28) operated upon for septoturbino-plasty, UP3 with tonsillectomy and genioglossus advancement.
- 2 TTs performed in urgent conditions due to respiratory obstruction occurring during post-operative hospitalisation in the ward, both carried out within 6 hours of awakening in the following cases:
  - L.B. (45-year-old male, BMI 33.8, RDI 67) operated upon for UP3 and genioglossus advancement;
  - Z.F. (51-year-old male, BMI 25, RDI 17) operated upon for turbino-plasty, UP3 and genioglossus advancement.

The 10 programmed tracheotomies (2.1% of the 472 patients operated) were decided upon according to the following criteria:

- difficulty in re-intubation expected (with consequently higher risk in the event of post-operative respiratory obstruction);
- OSAS severity;
- Multilevel treatment (with/without nose surgery which, for example, excludes the use of n-CPAP) and type of procedure (TT mandatory in case of Chabolle TBRHE, TT more advisable if genioglossus advancement is associated with hyoid suspension).

In fact, the 10 programmed TTs were performed in patients with mean BMI of 31.5 (range: 26.2-36.5) and mean RDI of 61.3 (range: 40-75), all with procedures at three sites (pharyngeal site was submitted to hyoid suspension in 3 cases, genioglossus advancement in 3, and simultaneously with hyoid suspension and genioglossus advancement in 4 cases).

As far as concerns complications associated with TT,

it is worthwhile mentioning a temporary case of laryngeal diplegia. The patient (P.M., 65-year-old male, BMI 30.1, RDI 62) had been submitted to septoturbino-plasty, UPPP with tonsillectomy, hyoid suspension, genioglossus advancement and programmed temporary tracheotomy. Thirty-six hours after awakening (2<sup>nd</sup> post-operative day), the patient was returned to the operating theatre on account of sudden haemorrhage from the tracheotomy: haemorrhage was due to the lower left thyroid artery which was clamped and tied. The following day (3<sup>rd</sup> post-operative day), after deflating the tracheotomy tube was deflated, the patient complained of aspiration: transnasal fibroscopy revealed laryngeal diplegia with vocal chords in a paramedian position, the voice was muted during phonation with deflated tube. Steroid therapy was associated and the tracheotomy tube was maintained moderately inflated to avoid marked pressure on the tracheal walls. On the 4<sup>th</sup> day, only a mild bilateral laryngeal paresis was present which, moreover, was completely and permanently resolved after the 5<sup>th</sup> post-operative day, with immediate recovery of swallowing and with normal phonation. The patient later reported that recovery of swallowing occurred rapidly and was strictly related, in time, to the deflation of the tube cuff.

## Discussion and conclusions

TT, crucial in elective conditions of surgery, appears to be mandatory in not rare cases of OSAS patients in whom tracheal intubation is unexpectedly found to be impossible during the induction phase of anaesthesia or when the need for re-intubation is not feasible in the post-operative phase.

Albeit, there were no deaths in the present series, due to TT, the use of which appears:

- clearly very limited, but not negligible (3.6%);
- clearly related to the severity of OSAS;
- strictly related to the type of procedure:
  - TT is mandatory in Chabolle TBRHE
  - TT is frequently necessary following genioglossus advancement (3/10 operated upon for genioglossus advancement not associated with a programmed TT = 30%)
  - TT is rarely necessary following hyoid suspension (1/98 operated upon for hyoid suspension not associated with a programmed TT = 1%).

Respiratory obstruction which occurred in patients submitted to genioglossus advancement in the early hours after surgery may easily be explained by a post-operative swelling of the base of the tongue, whereas in those cases of respiratory obstruction upon removal of intubation, the most probable cause would appear to originate from paresis (bilateral paralysis of hypoglossus following the infiltration of

anterior oral floor with epinephrine anaesthetic).

The case presenting respiratory obstruction following removal of intubation occurring after hyoid suspension is difficult to explain: it is tempting to hypothesise a temporary laryngeal diplegia due to stretching of the nerves.

As far as concerns the episode of temporary laryngeal diplegia occurring after performing TT, the following considerations appear worthwhile:

- This is a complication of the tracheotomy never reported in the recent literature;
- The cause cannot be easily confirmed stretching, albeit, it should be pointed out that:
  - the extremely rapid duration of paresis makes surgical trauma on recurrent nerves impossible;
  - the compressive mechanism could hypothetically be due to an excessive inflation of the cuff of the oro-tracheal tube before and/or of the tracheal tube after;
  - less likely would be the compression exerted

by the post-tracheotomy haemorrhage;

- stretching related to simultaneous traction exerted by the hyo-thyroid suture used with the antero-inferior hyoid suspension can only be hypothesised (in this case, this would be a complication related to the hyoid suspension and not to the tracheotomy);
- if this occurs in the immediate post-operative period following multilevel surgery of snoring with associated tracheotomy, a transitory laryngeal diplegia may go unnoticed inasmuch as early disorders in swallowing are constant and substantial hypo-aphonia does not necessarily give rise to suspicion if ventilation is possible only through the tube or if the cuff is kept inflated.

Even if no similar data have appeared in the literature, TT should, in our opinion, be considered amongst the surgical techniques that the surgeon of snoring should acquire, particularly on account of the not rare urgent and emergency situations which may occur in OSAS patients.

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■ Received October 21, 2002.  
Accepted January 7, 2003.

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