Tracheal stenosis after intubation and/or tracheostomy

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Abstract
Introduction: The tracheal iatrogenic stenosis remains a frequent, sometimes severe tracheal resection, anastomosis is the treatment of choice. However, the endoscopic treatment is used as an alternative therapy.

Materials and methods: We report a retrospective study for a period of 8 years.

Results: 174 patients had an iatrogenic tracheal stenosis of intubation (55.17%) and/or tracheostomy (44.82%).

The appearance and extent of stenosis were assessed by bronchoscopy, we noted a tracheal malacia (15%), a circumferential stenosis (58%), a little tight stenosis (12%) and diaphragm (5%).

Some patients have benefited from several therapeutic procedures, 90 patients were operated on early interventions with 53 and 37 after surgery, an improvement of the patient’s clinical status have been postponed earlier, after failure of endoscopic methods. 293 interventional bronchoscopies were performed, 192 stenting, 45 Nd-YAG laser, 55 patients required a recalibration in the tube of the bronchoscope and one patient received cryotherapy, knowing that there are the patients who received combination therapy. We lamented death in the immediate postoperative sepsis, a recurrence of stenosis in 117 patients, and among the 192 implants placed we identified 37 migrations, 52 congestion, development of granulomatous lesions, an overhaul of the prosthesis is noted in 7.29%, three implants were embedded in the tracheal mucosa and there was only one spontaneous rejection. The long-term evolution was satisfactory in 92 patients.

Conclusion: Nevertheless, the management of post intubation tracheal stenosis and/or post tracheostomy cannot be that requiring a multidisciplinary collaboration.

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Introduction
The tracheal stenosis is rare but serious complications of tracheal intubation and/or the tracheotomy are responsible for a significant operational impact, the frequency is of the order of 1% [1]. Different lesions can be found: granulomas, tracheomalacia, oesotracheal fistula, the glottis edema etc.
The diagnosis is often late and difficult to draw on the simple clinical conception because the clinical signs are not necessarily typical. Bronchial endoscopy is required to confirm the diagnosis and guide the treatment. Ideal curative treatment is surgery, but in case of permanent contra-indications or in case of emergency for patients with multiple co-morbidities, we decide an interventional endoscopy; this gesture does not prevent a possible subsequent curative surgery [1,2]. The purpose of this study is to clarify, by a retrospective study, the changes, also the endoscopic development of technics and surgical indications.

Materials and methods

We report a retrospective study conducted in the service of optic fiber endoscopy and interventional endoscopy at the hospital of Marie Lamellogue in France, over a period spanning from January 2000 to May 2007.

During this period, we collected 174 cases of tracheal after intubation stenosis and/or after tracheotomy; we examined the epidemiological and clinical profiles, the radiological data, and especially the different endoscopic therapies and methods performed formerly.

The data were taken and analyzed by using the SPSS for Windows software (version 9.0). In the descriptive analysis of all patients, continuous variables have been expressed by the mean (± Standard Deviation); extreme and median. Discontinuous variables were represented by frequencies. The trusted interval of the estimations was 95%.

Results

This is an 8-year study involving 174 patients with tracheal iatrogenic stenosis. The study included 92 men (52.87%) and 82 women (47.13%), the sex ratio is 1:2 (men/women). The average age is 53 years old, with extremes ranging from 1 to 87 years old. Decade in the distribution is shown in Fig. 1.

This care has required several hospitalizations for the practice of one or more acts (endoscopy or surgery), the number of average stay is two hospitalizations per patient with extremes of 1–16 stays. The average length of the stay is 6 days with periods varying from 2 to 25 days; we found that the length of the hospital stay was longer especially for a surgical care.

On the etiological plan, most of the patients have a history of intubation (96 patients or 55.17%) and/or tracheotomy (78 patients or 44.82%). It is therefore tracheal after intubation stenosis and/or after tracheotomy. The causes that triggered the intubation and/or tracheotomy are known and classical causes, with, at the forefront, an acute respiratory failure in 23.6% of cases (41 patients). These patients do present exacerbations with chronic obstructive lung diseases (bpcO), of their asthma or having acute respiratory distress.

In the second place we find neurological injuries (38 patients or 21.80%) including cerebral vascular accidents (CVA), brain hemorrhage, head injury and coma of diverse etiologies; 33 patients (19%) were for intute of a previous surgery, 27 patients were victims of heart disease accidents (HDA) (15.50%), 19 patients had heart disease (10.90%), attempted suicide was found in 11 patients (6.3%) and 5 patients had a burn extent (2.9%) as shown in Fig. 2.

The free interval (time between extubation sells and diagnosis of tracheal stenosis) averaged 4 months (median 3), certain stenoses have appeared very early with a space of 7 days, others appeared very belatedly 9 years after the initial intensive care.

The method of discovery was in all cases dyspnea mainly inspirative, compounded by the typical effort with a draw and a cornage (35%), with wheezing chest (25% of cases). In 10% of cases the stenosis was discovered in emergency, setting of an acute dyspnea in the context of an acute respiratory failure. The chest X-ray, used for all patients (100% of cases), was normal in 148 patients, and it has guided the diagnosis of tracheal stenosis in 9 cases by showing a clarity and a tracheal clearance and a tracheal decrease of tube in 17 cases. The scanner chest was achieved in 63% of cases; the lesion was classified as an inflammation in 55% of cases, granulomatous for 26% and fibrous in 19% of cases.

The type and extent of stenosis, ascertaining its severity, have been better appreciated by a bronchial endoscopy which has been carried out for all our patients. Different endoscopic aspects were noted: a trachea in 15% of cases, circumferential tight stenosis in 58% of cases, a little tight stenosis in 12% of cases and diaphragm in 5% of cases.

The location of stenosis in relation to the vocal cords was on average 2.80 cm with a median of 2.5 cm and from 1 cm extreme to 7 cm. Its distance from the shrouds is on average 5.12 cm (median 5 cm) and extremes of 2–8 cm; its breadth average was 2.54 cm with extremes of 1–8 cm (median of 2.25 cm). These measurements were important to be taken into account for the various therapeutic indications. Lastly reducing the size of the trachea, which determines the percentage of stenosis, has averaged 64% (median 70%) and extremes of 10–95% of stenosis (Table 1).

For the care, it is first necessary to note that some patients have gotten several therapeutic processes in the care of their stenosis, and a total of 383 acts, different therapeutic for 174 patients, 90 patients (50.72%) were operated: 53 first interventions and 37 of them had surgical acts; an improvement of the patient’s clinical status have been postponed earlier, after failure of the endoscopical methods. The act consisted of a surgical resection anastomosis (termino-terminal), with or without lowering laryngeal depending on the location of the stenosis. We made 293 intervetional bronchoscopies, 192 rigid bron-
choscopies for stents pose (65.52%), prostheses were not covered, self expandable type Dumon (endoxane) in the majority of cases. The installation was carried out successfully, without preoperative notable accidents. All patients were waken up without ventilatory assistance and all patients had endoscopic systematic control, the next day was very satisfactory. We do not regret any death or serious accident, we have not had any local complications. The average length of hospital stay was of 3.3 days (median 3 days, extreme 2–5 days). 45 patients had a profit ND-YAG laser (15.3%), 55 patients had required a recalibration of the bronchoscope tube (18.7%) and one patient received a cryotherapy, knowing that there are patients who received combination therapy (laser and prosthesis, and laser surgery and recalibration tube followed by the installation of endo). We made 47 final tracheotomies, so 27% of cases. While these gestures have been set up in a room of bronchoscopy very well equipped in the presence of an anesthetist and an intensive care physician near an operating theater, under general anesthesia (short time = sedation) and under local anesthesia owed to xylocaine.

Among the 383 therapeutical acts carried out in therapeutical care of our patients, we did regret a death in the immediate post-op in a sepsis table, a recurrence of the 117 patients with stenosis; 30.54% of cases. Among 192 prostheses, we identified 37 migration mostly downwarded (19.27%) that requires a repositioning in 5 cases and a change in the other cases, 52 congestions and obstructions by purulent secretions having justified their change (27.08%). The development of granulomatosis lesions – with at the end of the prosthesis 8.85% – a reworking of the prosthesis was observed in 7.29% of the cases. Three prostheses were embedded in the tracheal mucosa (1.5%) and we noted a single spontaneous rejection of the prosthesis (0.5%), (Fig. 3). Long term development was satisfactory for 92 patients (no recurrence of the stenosis), 77 patients have lost sight and we deplore 5 deaths.

Discussion

Iatrogenic stenosis after intubation and/or tracheostomy continues to pose serious problems [3–5], they are classified among the late complications of intubation and/or the tracheotomy, and are mainly due to the contact with the tip of the rigid intubation tubes or tracheotomy tube. These lesions are also put on the Balloon account whose strong pressure leads to an end of the infusion of capillaries in the tracheal mucosa leading to ischemia. Healing by fibrosis leads to tracheal stenosis [4], although the incidence of such injuries has been reduced, yet they are continued to be observed [3]. Knowing their etiologies and improved treatment possibilities have reduced their incidence [2,3]. Most of the patients in our study presented the first clinical signs of stenosis within 4 months after the extubation. The new or the worsening residual dyspnea, within weeks or even days after the episode of ventilation, should refer to the diagnosis of tracheal stenosis and even if intubation was short-lived. The definitive treatment of after tracheal intubation strictures and/or after tracheotomy is based on resection anastomosis sick segment. The achievement of the anastomosis is facilitated by lowering laryngeal or when an important mobilization is necessary just to free the trachéobroncical bifurcation (stenosis particularly long) [6]. The failure rate is 15% [7–9] when taking into account the long-term results (late recurrences). The mortality of surgery in the after intubation stenosis and/or after tracheotomy is indeed between 1%, 8% and 5% [7–9]; it is a surgery aimed at vulnerable patients [9]. The risks depend at least as much on the case (respiratory state, cardiovascular and neurological), than on the lesion.

<table>
<thead>
<tr>
<th>Sharing according to antecedents: n=174</th>
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<tbody>
<tr>
<td>Extent burn</td>
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<td>IRA</td>
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<td>Cardiopathy</td>
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<td>Previous Interventions</td>
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<td>Highway Accidents</td>
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<td>Suicide Attempt</td>
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<td>Neurological Accidents</td>
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![Table 1](https://example.com/table1.png)

Table 1  Localisation of stenosis.

<table>
<thead>
<tr>
<th>Distance of vocal cords stenosis (in cm)</th>
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<tbody>
<tr>
<td>Average</td>
<td>2.80</td>
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<tr>
<td>Median</td>
<td>2.50</td>
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<tr>
<td>Extreme</td>
<td>1–7</td>
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<tr>
<th>Expansion of stenosis (in cm)</th>
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<tr>
<td>Average</td>
<td>2.54</td>
</tr>
<tr>
<td>Median</td>
<td>2.25</td>
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<td>Extreme</td>
<td>1–8</td>
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<tr>
<th>Distance of carina tracheae (in cm)</th>
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<tbody>
<tr>
<td>Average</td>
<td>5.12</td>
</tr>
<tr>
<td>Median</td>
<td>5</td>
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<tr>
<td>Extreme</td>
<td>2–8</td>
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and its treatment [9]. This surgery cannot therefore be practiced in “Hot”, to prepare the patients to surgery. Endoscopic treatment is often necessary. In the largest surgical series, 71%, 53% and 26% of patients, respectively received 1.2 and 3 rigid preoperative bronchoscopies [7,8]. In our series, 90 patients were operated, of which 37 have benefited from one or more prior bronchoscopy. The endoscopic treatment was therefore justified by the fact that the diagnosis is made in 50% of cases in the context of the urgency (respiratory distress), for patients for whom curative surgery is contra-indicated or postponed. Even incomplete, the bronchoscopic disobstruction has always been effective immediately and usually spectacular [6,10]. It finds its place in the initial care, a specific review injury will be considered “Cold” in a patient in good general condition and whose respiratory condition was stable. In the case of a malatical or a long stenosis, the establishment of a stent may be indicated [2]. After the first bronchoscopy, the treatment depends on the profile of the development of the stenosis (stabilization or recurrence), also on the case and the equipment of the stricture by endoprosthesis. According to Bisson’s works [11], we believe that if the treatment is limited to a single meeting of dilation, the risk of expansion restenose is close to 90%. If restenose, further medical treatment is the alternative a transitional or permanent tracheal restorative surgery. When there are contraindications to surgery, moreover, opposing the restenose, medical techniques allow to certain stenosis, initially malacical and inflammatory stenosis, to move toward a fixed fibrous stage [12] and when the prosthesis is removed secondarily, stenosis may remain moderate without any clinical translation [13–15]. In the case of simple stenosis in a diaphragm, in a series of [16] patients, the radical incision of stenosis with Nd Yag laser, followed by a dilation mechanical rigid bronchoscopy, could cure with a success rate of the order (60%), after one or three sessions. In the case of complex stenosis, the development of prosthetic endotracheal during the first bronchoscopy can be justified by the risk of inefficiency or relapse after simple dilation. Dumon’s prosthesis of silicone is preferable to be used by the majority of specialists; they are easily mobilized and their secondary extraction is therefore easy, not prohibiting a second tracheal curative surgery – if the patient should be secondarily operable. Their tolerance is extremely excellent [1,17,18]. In our series, among the 192 prostheses made, 68 patients had a positive evolution. Obstruction by impaction on the inner walls or by a development of granulomas at proximal is rare but may require the removal of the prosthesis [1]. The secretions can be removed under a simple optic fiber endoscopy or may need a rigid bronchoscopy; these obstructions are however potentially deadly [18,19]. The granulomas can be treated by cryotherapy destruction or electrocoagulation without the risk of deterioration of the prosthesis; they may finally require the establishment of a longer prosthesis. The secondary migration of the prosthesis is in practice their main drawback, it may result in an irrepressible cough, lung congestion and dyspnea; table is sometimes acute, require a conducting emergency bronchoscopy to remove the prosthesis, to dilate stenosis and, possibly, to submit a new prosthesis diameter of more than [1,18]. In the literature, it has made in a series of 263 patients a percentage of migrations and obstructions respectively of 18.6% and 5.7% [18,20], in our series there were 19.27% of migrations and 27%, 08% of congestions and obstructions.

Conclusion

The progress of resuscitation with improving care for ventilated patients has led to a marked decrease in the incidence of tracheal stenosis compared to the years 1970–1980. That is to say that, anyway, the assumption of after tracheal intubation stenosis and/or after tracheotomy can require a multidisciplinary collaboration between ENT (ORL in French), lung, anaesthetist, thoracic surgeons, radiologists and intensive care physicians. The place of each therapeutic technique is clearly stated.

If surgery is the treatment of choice, the contribution of intraprothesis helped care for frail patients, compared to surgery indicated, in order to avoid iterative expansion. Such endoscopic (very satisfactory results) should now be an integral part of our therapeutic arsenal [2].

Conflicts of interest

None declared.

References


