Long-term esophageal motility changes after thyroidectomy: associations with aerodigestive disorders


Summary: Long-term esophageal motility changes after thyroidectomy: associations with aerodigestive disorders.


Background. Patients undergoing thyroidectomy often complain of aerodigestive disorders. In a previous study we showed the associations between voice impairment and proximal acid reflux, swallowing impairment and Upper Esophageal Sphincter (UES) incoordination and the decrease in UES pressure in thirty-six patients observed before and soon afterwards uncomplicated thyroidectomy. This study investigated the state of post-thyroidectomy esophageal motility changes and its associations with these disorders after 18-24 months.

Patients and methods. The thirty-six patients prospectively recruited according to selection criteria (thyroid volume ≤60 ml, benign disease, age 18-65 years, previous neck surgery, thyroiditis, pre- or postoperative vocal cord palsy) underwent voice (VIS) and swallowing (SIS) impairment scores, esophageal manometry and pH monitoring once again.

Results. After 18-24 months, both VIS and SIS recovered (respectively: p=0.022; p=0.0001); UES pressure increased (p=0.0001) nearing the preoperative values. The persistence of swallowing complaints were associated with the persistence of esophageal incoordination (p=0.03); the association between voice impairment and proximal acid reflux was confirmed (p<0.001).

Conclusions. Our study confirms that aerodigestive disorders after uncomplicated thyroidectomy, largely transient, are strictly connected with upper esophageal motility changes. In this viewpoint, the innervation of upper aerodigestive anatomical structures (larynx, pharynx, upper esophagus) and its variations should be focused.

Key words: Thyroidectomy - Dysphagia - Swallowing impairment - Voice impairment - Aerodigestive symptoms.
plaints that appear as a consequence of a laryngeal nerve (inferior and superior) lesion, but it is well known that, in most cases, the vocal and swallowing disorders appear even after uncomplicated thyroidectomy (3, 8, 12). Symptoms such as hoarseness, sensation of a “lump”, a “too-tightly buttoned shirt collar”, “foreign body”, “being strangled”, “obstacle during swallowing” or cough are frequently described after thyroidectomy, even in absence of evident laryngeal nerve damage (12-15). Several causes have been assumed to explain the association between thyroidectomy and voice and swallowing disorders. In a previous study (3), we specifically examined some functional changes in esophageal motility that were observed after uncomplicated thyroidectomy in a short time of observation (30-45 days after surgical operation). The present long-term study complete the investigation evaluating the same esophageal motility changes in the same sample of patients 18-24 months after the thyroidectomy.

Patients and methods

The patients had been scheduled because of a nodular thyroid disease (solitary nodule, multinodular goiter) for total thyroidectomy from January 2010 to September 2011. The Table 1 summarizes the exclusion criteria, those could be noticed in the preoperative period as well as after thyroidectomy, previously stated. The Table 2 describes the demographic data of the patients enrolled in the study. The thyroid volume had been calculated in the preoperative period by applying the ultrasound measurement: \( V = \text{ld} \times \text{td} \times \text{th} \times 0.5 \) for each lobe (\( \text{ld} \) = longitudinal diameter of the lobe; \( \text{td} \) = transversal diameter; \( \text{th} \) = lobe thickness; 0,5 = correction factor for transforming the obtained volume from parallelepiped to an ellipsoid). The autoimmune thyroiditis and the carcinoma had been excluded with conventional clinical, laboratory and pathologic findings. The patients had undergone a preoperative and a postoperative evaluation of vocal fold function. The clinical and laboratory follow-up were stated by a referral endocrinologist. All the patients had been operated on by the same surgical team (2 surgeons among G.G., G.S., N.C.P for each procedure) and with the same surgical criteria concerning the dissection and the preservation of the laryngeal nerves and the parathyroid glands, without using a nerve monitoring. The conventional “knot tie” technique had been applied for larger goiters; according to conventional inclusion criteria (16) in a total of 16 case a “minimally incision” procedure had been performed, 9 of which were MIVATs. In these specific cases, an energy-based surgical instrument had been used (17).

All the patients enrolled in the preliminary study performed at our institution underwent a new comple-
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Table 3 - Trends of Aerodigestive Symptoms.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Preoperative</th>
<th>1 month after surgery</th>
<th>Long-term</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIS = 0 *</td>
<td>22.22%</td>
<td>44.44%</td>
<td>58.33%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>VIS = 0 *</td>
<td>44.44%</td>
<td>58.33%</td>
<td>69.44%</td>
<td>= 0.001</td>
</tr>
</tbody>
</table>

*Note that the higher is the disorder value, the more symptomatic is the patient.

Results

The results of VIS, SIS and UES pressure (preoperative; 30-45 days after operation; 18-24 months after operation) were recorded in three box plot graphics. A Freedmann non-parametric test was applied with the aim to identify the significance in the changes of the results of each class of measurements. Concerning the SIS evaluation, the difference of results before, 1 month and 18-24 months after thyroidectomy was significant (p=0.0001 < 0.05). Moreover, the average of patients complaining aerodigestive symptoms decreased during the time (Table 3), concerning the voice (Figure 1) as well as the swallowing (Figure 2).

UES pressure showed a long-term increasing (p<0.0005) and neared the preoperative values (Figure 3).

Moreover, at the long-term control, 20 patients improved the SIS, but 16 had not a variation of this score. All the three patients who showed a persistence of UES incoordination were included in this group. This association should be considered statistical significant (p=0.03).

The correlation between the 23 patients that complained a persistence or impairment of voice symptoms and the 15 who had an esophageal acid proximal reflux was confirmed (p<0.001).

Finally, it should noted that the 11 patients in which the VIS increased (worsened) at the long-term control, had at least one between reflux or UES pressure decrease.

Discussion

The aerodigestive disorders associated with uncomplicated thyroidectomy are reported in several studies (2, 12-14). As commonly observed, they can also precede the surgery, and, in some cases, they can be explained as a consequence of the thyroid disease (3). These complaints, together with other, may affect the quality of life (21-23). Both symptoms are very frequent even in non-thyroidectomized patients (24, 25). In our previous study we investigated these symptoms in both clinical and functional views. The causes previously appealed were orotracheal intubation, changes in laryngeal vascular net, cricothyroid dysfunction, denervation of neck muscles, neck pain or anxiety. The role of the type of endocrine neck disease, the technique used and the extent of surgery play an unclear role in the origin of these symptoms; neither the possible advantages of minimally-invasive techniques have been clarified (5, 15, 26-33). Another possible risk factor for aerodigestive complaints is the intraoperative bleeding (34). The hemostatic tools are usually used at our Institution with the aim of reducing the incidence of this event this as well as possible (35-37), but we have not investigated yet the possible advantages of this practice in reducing these symptoms. A recent study carried out with ultrasonic analysis of laryngeal movements,
showed a significant impairment of laryngeal mobility in the early post-thyroidectomy period in a selected group of patients, a partial recovery of these instrumental findings in a long-term control (6 months) (38).

Although these evidences confirm an involvement of several laryngeal, pharyngeal and esophageal functional changes in the post-thyroidectomy aerodigestive symptoms, we would underline that some of these could be present before the thyroidectomy (3); these symptoms are acceptable indications for thyroidectomy, but an association with laryngopharyngeal reflux has also been found (39).
The role of the damage of terminal nervous branches and anastomoses of the laryngeal superior and inferior nerves, concerning the somatic and the autonomous system, have been already discussed (3, 14). Further interesting results of the previous study were:

- the variable but unchanging decrease in UES pressure;
- the possible correlation between wide decrease in UES pressure and appearance of its incoordination;
- the association between UES incoordination and swallowing alterations;
- the association between acid proximal reflux and voice impairment.

These results led us to hypothesize a likely role of UES pressure decrease in promoting on one hand its own incoordination and, as a consequence, the post-thyroidectomy swallowing impairment. On the other hand, this pressure decrease could make itself less effective towards proximal acid reflux, that could explain why the patients that underwent thyroidectomy complained voice impairment in the contemporaneous presence of proximal acid reflux.

The present long-term study confirmed that the clinical aerodigestive symptoms and the esophageal motility changes after uncomplicated thyroidectomy are related each other and showed that they are largely, but not invariably (40, 41), transient. In our study, the VIS and SIS improved 18-24 months after the thyroidectomy in comparison with the results of the immediate postoperative period. Moreover, the trend in postoperative UES pressure allows us to confirm and strengthen the hypothesis of the crucial role of the UES in determining the physiology of the upper aerodigestive tract. In fact, in the present study its basal pressure tend to recovery in the same way with the voice and swallowing disorders. In the patients in which the voice complaints worsened, the unchanging presence of acid reflux or UES pressure decrease, an action of acid, direct or secondary to the UES failure should be invoked as a cause of voice impairment. Likewise, the swallowing complaints persist in association with the UES incoordination; this one is a physiological change strongly associated to a persistent full decrease of its pressure, then the UES could be concerned once again.

The limitations of our studies are the small size of the sample of patients involved and the absence of comparison with a comparable group of non-operated individuals, but we think that they are useful because these functional points of view have not been evaluated elsewhere.

Conclusions

The present study confirms the results previously obtained at our Institution and enhance the role of the upper aerodigestive motility and, for some aspects, of the proximal esophageal acid reflux in supporting the post-thyroidectomy voice and swallowing complaints. The...
se changes usually come down or disappear, but they can continue during the time and become chronic.

The complexity of mechanisms involved do not allows, at the moment, a clear and complete pathogenetic hypothesis.

Our findings put the UES pressure decrease on the centre of attention in leading aerodigestive disorders, but we are conscious that other studies enhance different mechanisms in determining these disorders. All in all, our study showed some correlation between this specific change and the trends of these disorders.

In our viewpoint, the reduced UES pressure calls the attention to the innervation of upper aerodigestive anatomical structures such as larynx, pharynx and upper esophagus.

Further studies are needed for a more accurate explanation of the pathophysiological mechanisms involved in the correlation between the esophageal motility changes and the voice and swallowing complaints.

At the moment, we think that the patients should be informed of the possibility of these disorders at the moment of drafting of the informed consent.

References


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