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CASO CLÍNICO

Positive Cuff Leak Test in a Patient with Post-Extubation Stridor After Total Thyroidectomy. How to Deal With It?

Teste Cuff Leak Positivo em Doente com Estridor Pós-Extubação Após Tiroidectomia Total. Como Atuar?

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ABSTRACT

Thyroid surgery is the most frequent cause of bilateral vocal cords palsy. This emergency is rare and can cause post-extubation stridor by recurrent laryngeal nerve section.

We report a case of a patient proposed to thyroid surgery. In the end of an uneventful surgery, qualitative cuff leak test was positive. Neverthless, patient was extubated. She started post-extubation stridor two minutes later and was reintubated. Direct laryngoscopy demonstrated adduction of vocal cords and, because she maintained immobility of the glottis, she was tracheostomized for six months.

Qualitative and quantitative cuff leak test is a costless easy method that allows us to evaluate the possibility of recurrent laryngeal nerve lesion prior to extubation. Very little is known about the cuff leak test utility on thyroid surgery, about its importance in high-risk patients and if extubation can be wheighted based on its result.

A cuff leak test protocol with a datasheet were created and adapted to thyroid surgery in our department.

RESUMO

A cirurgia da tiróide é a causa mais frequente de paralisia bilateral das cordas vocais.É uma emergência rara e pode causar estridor pós-extubação pela secção do nervo laríngeo recorrente. Numa doente submetida a uma cirurgia da tiróide sem intercorrências, o teste *cuff leak* qualitativo foi positivo no final da cirurgia. Contudo, a doente foi extubada, iniciou pós-extubação dois minutos depois e foi reintubada. A laringoscopia direta demonstrou adução das cordas vocais. Ficou traqueostomizada durante seis meses. O teste *cuff leak* qualitativo e quantitativo é um método simples, sem custos e permite-nos avaliar a possibilidade de lesão do nervo laríngeo recorrente antes da extubação. Sabe-se muito pouco acerca da utilidade do teste *cuff leak* em cirurgia da tiróide, sobre a sua importância em doentes de alto risco e se a extubação deve ser apoiada no resultado do teste. Um protocolo acerca do teste *cuff leak* e uma folha de recolha de dados foram criados e adaptados à cirurgia da tiróide no nosso serviço.

INTRODUCTION

Thyroid surgery is the most frequent cause of bilateral vocal cords palsy. Although a bilateral vocal cords paralysis is rare, it will very likely complicate with a post-extubation stridor caused by recurrent laryngeal nerve section.[1,2] Some authors show that recurrent laryngeal nerve palsy rate in thyroid surgery varies from 0.5% to 20%.[3] Qualitative and quantitative cuff leak test is easy to use and allows us to evaluate the possibility of recurrent laryngeal nerve lesion prior to extubation. If the cuff leak test is positive, this means there is no air leak around the endotracheal tube with a desinsuflated cuff. Therefore, the patient may have a vocal cord injury and consequently develop post-extubation stridor.[4-6]

However, very little is known about the cuff leak test utility on thyroid surgery.

Hereupon, and because we had a clinical report of a post-extubation stridor in a thyroid surgery, we decided to create a protocol of cuff leak test. Its main purpose is to help the anesthesiologist manage the suspected cases of vocal cord injuries before extubation through an easy and costless method.

CASE REPORT

A 61-year-old female, 75 kg, with a history of diabetes, dyslipidemia and osteoporosis was scheduled for a total

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thyroidectomy due to a multinodular goiter with a dominant nodule in the superior left lobe suspected of papillary carcinoma. At the age of 30 she had a probable vocal cord lesion after a caesarean section with general anaesthesia and the need for temporary postoperative intubation. At the present, the patient did not have any clinical airway sequelae and had no known allergies.

Pre-operative airway evaluation was not predictive of any difficulty. Moreover, the patient was not submitted to indirect laryngoscopy as this is not a routine procedure in these situations. Hemogram, biochemistry with calcium and blood coagulation were in the normal range. The chest radiograph did not show any evidence of tracheal deviation or any other anomaly. In the intra-operative period, the patient was monitored with standard American Society of Anaesteshiology monitorization, anesthetic depth monitorization with BIS (Bispectral Index) and neuromuscular blockade with TOF (Train of Four). We performed a balanced general anaesthesia technique. For the induction, fentanyl, dexamethasone, propofol and succinylcholine were administered intravenously. Orotracheal intubation was regular with an endotracheal tube 7.0. The patient remained anaesthetized with sevoflurane, fentanyl and atracurium. At the appropriate time drugs were administered for analgesia and for postoperative nausea and vomiting. The surgery time was approximately seventy minutes and apparently was uneventful. After the surgical dressing, qualitative cuff leak test was performed prior to extubation with a positive result. Nevertheless, surgeon stated that he had directly observed the recurrent laryngeal nerve during the surgery and seemingly avoided any type of lesion. Additionally, because the cuff leak test was not performed immediately after intubation as mean of comparison, we decide to proceed with the extubation. The neuromuscular blockade was reverted guided by TOF with neostigmine and atropine. Patient was extubated after an adequate BIS value, TOF> 0.9, an effective spontaneous ventilation and integral airway reflexes. Two minutes later, she displayed a respiratory distress with inspiratory stridor and 70% of peripheric saturation of O_2. After unsuccessfully airway permeabilization maneuvers, propofol was administered and the patient was reintubated with an endotracheal tube 6.0. Direct laryngoscopy demonstrated adduction of vocal cords. Methylprednisolone was administered. There were not signs suggestive of anaphylaxis.

In the early postoperative period, an arterial gases sample revealed normocalcemia and surgical dressing was checked immediately and was intact. Otolaryngologist examined the glottis and in direct laryngoscopy immobility of the arthnoid region was observed as well as severe edema of ventricular bands. It was decided by consensus to transfer the patient to the Intensive Care Unit for later reassessment.

On the third postoperative day, otolaryngology performed a nasofibroscopy, which had a similar result to previous laryngoscopy.

On the fourth postoperative day, the patient maintained immobility of the glottis and was tracheotomised. She was discharged on the 24th postoperative day with one vocal cord paresis and palsy of the other one. Six months later the tracheostomy was successfully closed. During that time, she was submitted to conservative treatment (speech therapy sessions and physical medicine and rehabilitation consultations).

DISCUSSION

In thyroid surgery, risk factors for developing post-extubation stridor can be identified. Some of them are surgical extension, neoplasic surgery, surgical reintervention, surgeon's experience and anatomic variations.[7]

Although rare, post-extubation stridor after thyroidectomy is an emergency that imposes an early and adequate intervention of the anesthetist.

Intraoperative neuromonitoring of the recurrent laryngeal nerve is widespreadly accepted as the gold standard monitorization of vocal cords in the intra-operative period of thyroid surgery.

However, there is little standardization on its use, as well as some limitations, high costs and sometimes fallible results. It is indicated in thyroid surgery reintervention, patients with previous neck radiotherapy and patients with bulky masses or with contralateral nerve palsy. The time required for the correct tube placement with the electrodes adapted and the impossibility to use neuromuscular blockers are among its main limitations. It also has some false negatives such as nerve stimulation other than indicated, anesthetic depth, incorrect electrodes placement or displacement. One of the major concerns in the use of intraoperative neuromonitoring is its relative low sensitivity and positive predictive value.[3,8]

On the other hand, the cuff leak test is an evaluation method of the vocal cords shown to be useful in patients at high-risk for developing post-extubation stridor. The cuff leak test consists of an air leak evaluation around the endotracheal tube with a desinsuflated cuff, which will be inversely proportional to the laryngeal obstruction degree created by any mechanism of lesion of vocal cords. If there is no leak, the test is positive.[4] There are two types of cuff leak test: qualitative and quantitative. The former consists in the auscultation of the cuff and the latter consists in the measurements of tidal volumes with the patient in controlled ventilation and cuff leak volume calculation. Ideally, the test should be done after intubation and before extubation.[9]

It is known that in Intensive Care Unit, cuff leak test is a test with a low specificity, but with a high negative predictive value, low cost and easy to apply. Despite in disuse in Intensive care Unit, the utility of this test in thyroid surgery is still not

well known. In this type of surgery, it may be important to perform the cuff leak test in high-risk patients and extubation probably should be weighted based on its result.[9,10]

The choice of an endotracheal tube too large for the glottis size can result in a false positive test. This problem can be bypassed by performing cuff leak test after intubation.[10]

Another false positive can arise from different pulmonary compliances in different phases of volumes measurement. This may give an incorrect tidal volume measurement. That is why the patient should be in controlled ventilation and with proper neuromuscular blockade.[10]

A third false positive could occur due to the presence of secretions inside of the endotracheal tube and in the oropharynx. This problem can be easily controlled, performing a proper aspiration of secretions before extubation.[10]

In this clinical report, we would like to highlight that the qualitative cuff leak test was positive in this patient who presented some surgical and medical risk factors and who immediately developed a post-extubation stridor after a thyroid surgery. It should also be noted that the anesthetic team immediately excluded the main differential diagnoses (anaphylaxis, hematoma, hypocalcaemia, anesthetic depth and ineffective neuromuscular blockade reversal) for the development of post-extubation stridor before concluding that it was a vocal cord lesion.

Despite of a positive cuff leak test, as it was not performed immediately after intubation, the endotracheal tube size could be questioned. Due to this and the fact that the recurrent laryngeal nerve were directly observed, which is strongly reliable, it was decided to extubate the patient that developed post-extubation stridor minutes after.

It should also be pointed out the utility of the direct visualization of the vocal cords by direct laryngoscopy at the end of surgery and prior to extubation. It can be one of the methods used to assess the vocal cords mobility, but it can fail to give optimum visualization and predisposes the patient to significant discomfort and to undesirable changes in vital signs.[11] In fact, all the clinical and technical data should help the anesthesiologist in a more weighted decision about patient extubation.

It should be emphasized that the prompt and correct management of a post-extubation stridor must be more important than any attempt to predict its incidence.[6]

In this case, qualitative cuff leak test was performed before extubation and was positive.

In our opinion, the execution of the cuff leak test (qualitative and quantitative) after intubation and prior to extubation could have made the evaluation more reliable.

After this clinical report we reflect on how important it could be to investigate the applicability of this test in this type of surgery. Very little is known about the cuff leak test utility in

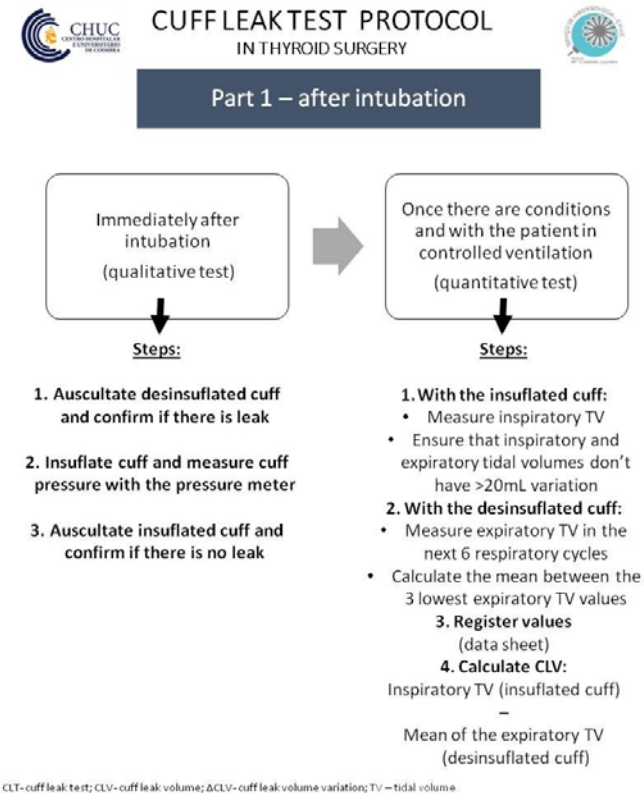

Figure 1. Cuff leak test protocol in thyroid surgery - after intubation

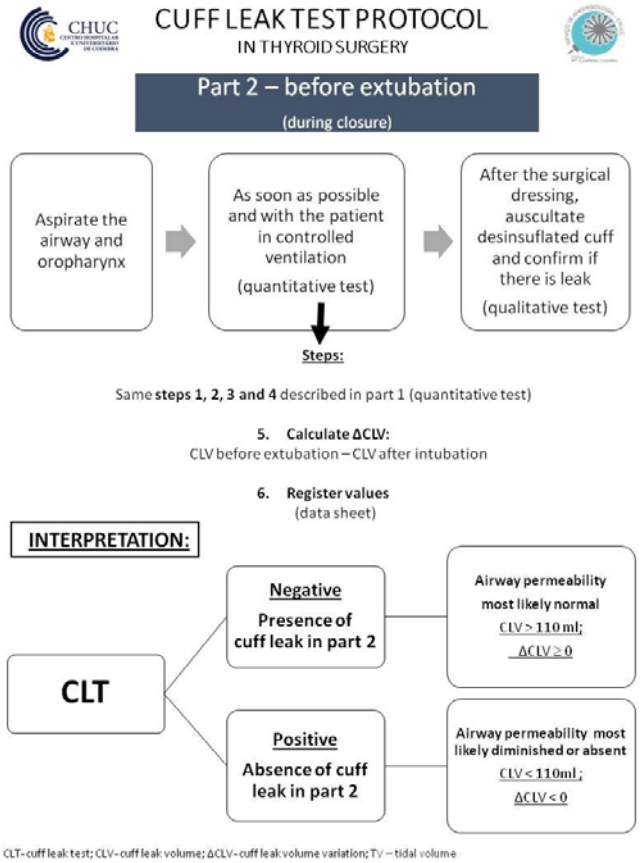

Figure 2. Cuff leak test protocol in thyroid surgery - before extubation

thyroid surgery.

Accordingly, a protocol of cuff leak test with a datasheet were created and adapted to thyroid surgery. It aims to detect precociously high risk patients in thyroid surgery, which are vulnerable to have vocal cords palsy, and avoid the development of post-extubation stridor with simple and cheap monitorization, bearing in mind there may be false results.

The protocol was introduced in our Anesthesiology Department and readily accepted. (Fig.s 1 and 2)

It will be in use in all operating rooms of general surgery.

In the future the data will be collected in order to understand how useful the cuff leak test is in thyroid surgery.

Responsabilidades Éticas
Conflitos de interesse: Os autores declaram não possuir conflitos de interesse.
Suporte financeiro: O presente trabalho não foi suportado por nenhum subsídio ou bolsa.
Confidencialidade de dados: Os autores declaram ter seguido os protocolos do seu centro de trabalho acerca da publicação dos dados de doentes.
Protecção de pessoas e animais: Os autores declaram que os procedimentos seguidos estavam de acordo com os regulamentos estabelecidos pelos responsáveis da Comissão de Investigação Clínica e Ética e de acordo com a Declaração de Helsínquia da Associação Médica Mundial.

Ethical Disclosures
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Confidentiality of data: The authors declare that they have followed the protocols of their work center on the publication of data from patients.
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