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Total thyroidectomy versus hemithyroidectomy for patients with follicular neoplasm. A cost-utility analysis

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ABSTRACT

Introduction: Thyroid nodules are a common condition. Overall, 20% of the nodules assessed with FNAB correspond to the follicular pattern. A partial thyroidectomy is the minimal procedure that should be performed to determine the nature of these nodules. Some authors have suggested performing a total thyroidectomy based on the elimination of reoperation and ultrasound follow-up. The aim of this study was to evaluate the most cost-useful surgical strategy in a patient with an undetermined nodule, assessing complications, reoperation, recurrence and costs.
Material and methods: A cost-utility study was designed to compare hemithyroidectomy and total thyroidectomy. The outcomes were complications (definitive RLN palsy, permanent hypoparathyroidism, reoperation for cancer, and recurrence of the disease), direct costs and utility. We used the payer perspective at 5 years. A deterministic and probabilistic sensitivity analysis was completed.
Results: In a deterministic analysis, the cost, utility and cost-utility ratio was COP $12.981.801, 44.5 and COP $291.310 for total thyroidectomy and COP $14.309.889, 42.0 and $340.044 for partial thyroidectomy, respectively. The incremental cost-utility ratio was −$535.302 favoring total thyroidectomy. Partial thyroidectomy was more cost-effective when the risks of RLN injury and definitive hypoparathyroidism were greater than 8% and 9% in total thyroidectomy, respectively. In total, 46.8% of the simulations for partial thyroidectomy were located in the quadrant of more costly and less effective.
Conclusion: Under a common range of complications, and considering the patient's preference and costs, total thyroidectomy should be selected as the most cost-effective treatment for patients with thyroid nodules and follicular patterns.
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1. Introduction

Thyroid nodules are a very common condition. It is estimated that 3–7% of world population have palpable thyroid nodules, and this prevalence may reach 76% when ultrasonography is used as a screening tool [1]. When a thyroid nodule is detected, the most important step in the assessment is to determine whether this nodule is a carcinoma or an adenoma, which is determined via fine needle aspiration biopsy (FNAB). It is accepted that 5–7% of all nodules are malignant [2]. However, in 15–20% of nodules assessed with FNAB, it is not possible to determine the true condition of the malignancy or benignity; these are assessed by follicular patterns or undetermined nodules. Recently, these nodules were included into category 4 in the Bethesda system [3]. The nodules may be malignant in 20–30% of cases [4,5]. Currently, it is accepted that in these cases, a partial thyroidectomy is the minimum surgical procedure that should be performed to determine the nature of the nodule. This strategy has some advantages, such as the maintenance of thyroid function without hormone supplementation, the lower risk of recurrent laryngeal nerve (RLN) injury and the null risk of hypoparathyroidism. However, it also has some disadvantages, such as the need to reoperate on the patient if the pathology report confirms a malignancy, the obligation to perform an ultrasonographic follow-up of the remnant lobe and the later risk of reoperation if another suspicious nodule appears in this lobe, which could reach 50% at 10 years [6]. Consequently, some authors

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have suggested the performance of a total thyroidectomy based on the elimination of the possibility of reoperation and ultrasound follow-up; however, this option runs the risk of an increased rate of RLN injury and definitive hypoparathyroidism and of the need for hormone supplementation for the rest of the patient's life. There is no agreement as to which of these alternatives should be chosen. In the scenario of a patient with goiter, which is common in some iodine-deficient areas, such as Latin America, Europe and Asia, the conditions of the patient modify the baseline in favor of one or the other procedure. In this specific case, the advantage of preserving the thyroid function is lost, and therefore, leaving a remnant lobe will still carry the risk of reoperation, only securing the advantage of less RLN injury. To date, there is no information directly comparing the two surgical procedures and assessing their clinical and cost outcomes concomitantly.

The aim of this study was to evaluate the most cost-effective surgical strategy in a patient with an undetermined nodule in the FNAB, considering the complications, reoperation, recurrence and hormonal support in the long term.

2. Material and methods

This is a cost-utility study. The protocol was approved by the ethics committee and supported by Universidad de La Sabana. The cases on which the study is based involve adult patients with a thyroid nodule and a reported follicular pattern in the FNAB in a general hospital in a developing country as Colombia. Based on this scenario, we excluded patients with comorbidities, previous neck or thyroid surgery, previous radioiodine therapy and pregnancy.

2.1. Alternatives

A decision tree with a Markov chain was assembled with the Treeage Pro (Treeage software, Inc; Williamstown, MA, USA) to compare two strategies, hemithyroidectomy and total thyroidectomy, as the initial surgical procedure (Fig. 1). The Markov nodes were introduced for the risk of recurrence on the contralateral lobe after partial thyroidectomy. The outcomes included were complications (definitive RLN palsy, permanent hypoparathyroidism, reoperation for cancer, and recurrence of the disease in the contralateral lobe), direct costs and utility. The time period selected was 5 years.

2.2. Complications and follow up

We completed a systematic review of the literature in the PubMed database with the terms “hypothyroidism”, “thyroid nodule”, “therapeutics”, “treatment” and “thyroidectomy,” searching for data on the incidence of complications for each alternative. We assumed that total thyroidectomy could produce definitive RLN and permanent hypoparathyroidism, but the possibility of reoperation and the necessity of follow-up were null. On the contrary, hemithyroidectomy could have RLN palsy, but not permanent hypoparathyroidism; a risk of early reoperation was present if a

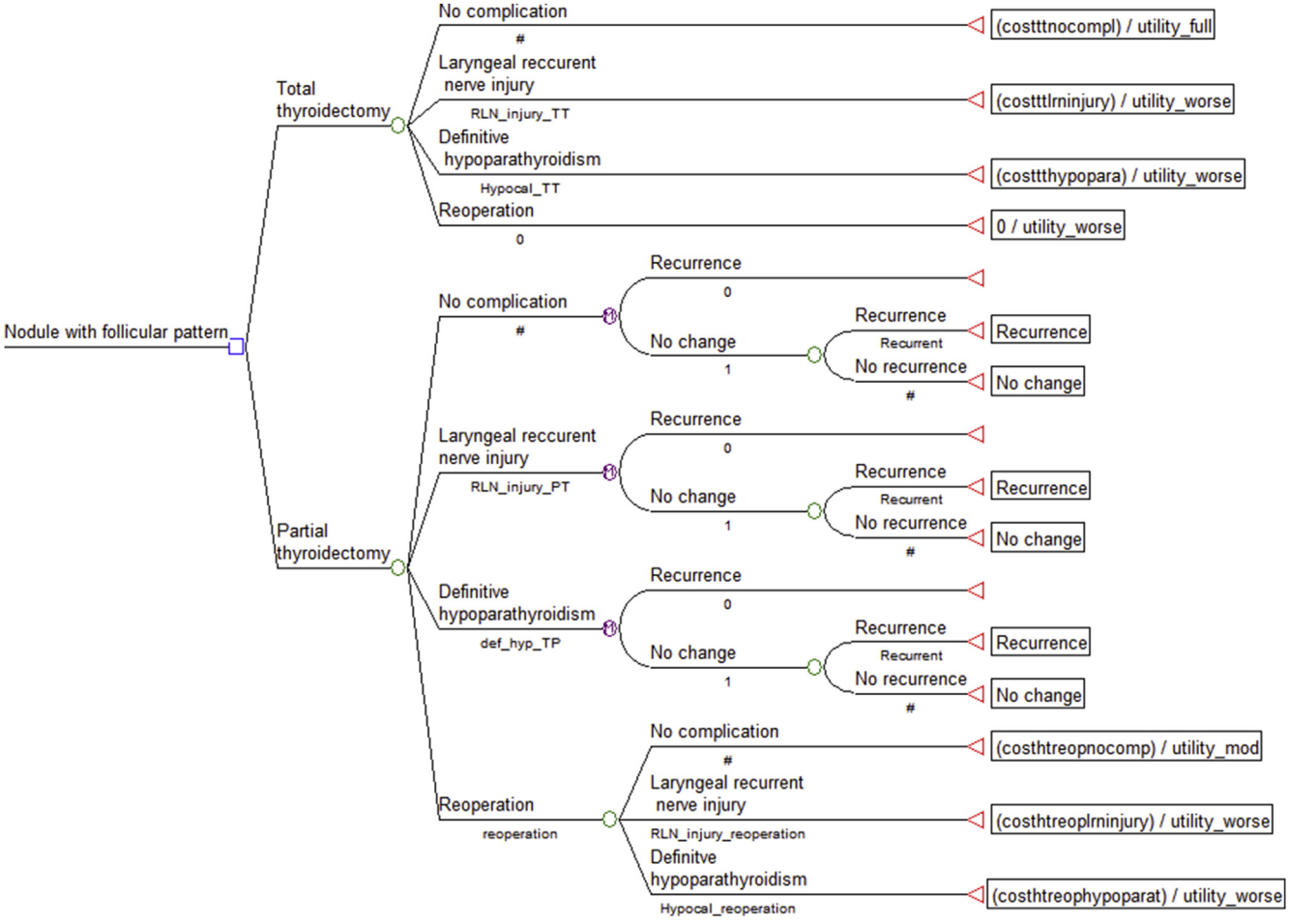

Fig. 1. Decision tree.

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