



## Case Series

## Effectiveness of hemi-thyroidectomy in relieving compressive symptoms in cases with large multi nodular goiter

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## ABSTRACT

**Introduction and importance:** This case series describe the efficacy of hemi-thyroidectomy to relieve the compressive symptoms of cases having large multi-nodular goiter with preservation of the thyroid gland function. It's considered as an education tool for surgeons to perform safe hemi thyroidectomy to patients indicated for total removal of the gland. Compressive symptoms like mild/severe dysphagia or dyspnea associated with both benign and malignant thyroid disease. Although total thyroidectomy is currently considered the standard of care, hemi thyroidectomy is another surgical option with more benefits.

**Case presentation:** This case series was performed in a tertiary university hospital in Riyadh, Saudi Arabia. It included 35 females and 3 males above the age of 18 (mean age 42 years). All the operations were elective hemi-thyroidectomies performed by one surgeon, during 2019. Patients were complaining of; Voice Change, Neck Swelling, Dysphagia, Chocking, SOB, and Orthopnea. 20 of them were medically free and 18 patients had multiple associated comorbidities.

**Clinical findings and investigations:** Demographic data, baseline co-morbidities, TSH levels prior to surgery, thyroid gland size, FNA results and pre-operative symptoms were recorded. In addition, compressive symptomatology outcomes from two weeks to two years were recorded. Thirty-two of them (84%) had their symptoms resolve completely and did not need a completion surgery. Out of the 6 who had persistent symptoms, only two needed a completion surgery. Furthermore, only 34.2% required thyroid hormone replacement, 31.6% were euthyroid and 2.6% were hypothyroid preoperatively.

**Interventions and outcome:** Hemi thyroidectomy was chosen to avoid the risk of hormone replacement, and hypocalcemia. Our results revealed that compressive symptoms were effectively relieved in the majority of our patients. Only 2 patients had to undergo completion thyroidectomy due to compressive symptoms with no perioperative or postoperative complications.

**Relevance and impact:** We would recommend hemi thyroidectomy for cases of large multi nodular goiter due to its positive implication on patient outcome particularly if the patient refuse hormonal replacement.

## 1. Introduction

Globally, the prevalence of thyroid goiter in the general population is estimated to be 15.8% [1], with a predilection for females [2]. Approximately 4% of the adult population are affected by one or more palpable thyroid nodules, most of which are benign [1–3]. In Saudi Arabia, the incidence and pattern of thyroid diseases are not well known due to the lack of a national registry. Compressive symptoms are common among patients with thyroid disease [4]. The most common

compressive symptoms are shortness of breath (SOB), dyspnea and dysphagia [5]. In rare cases, tracheal or esophageal compression can lead to acute airway distress and require emergent treatment including intubation or tracheostomy [6] (see Figs. 1–5)

Ten to 15% of patients with goiter ultimately require operative intervention, with surgery being an important treatment option that can immediately resolve local symptoms [7–9]. Moreover, operative options for benign thyroid conditions include hemi- and total thyroidectomy (TT), and the most ideal option to resolve compressive symptoms

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remains a matter of debate [9–12]. The surgical management of multinodular goiter (MNG) has evolved since the early 1990s, whereby subtotal thyroidectomy was gradually replaced by TT which later on TT took over almost half of the entire thyroid operation. Nevertheless, some studies do not prefer TT for MNG, due to higher rates of persistent or temporary recurrent laryngeal nerve (RLN) palsy and parathyroid damage [13,14].

The debate surrounding TT is torn between its benefit in eliminating the risk of recurrence versus its high complication rates, especially in less experienced hands. This has led some surgeons to avoid TT and recommend hemi thyroidectomy [9,13,15]. Hemi thyroidectomy may be superior to many thyroid procedures due to the partial retention of thyroid function. Patients can potentially avoid lifelong hormone replacement therapy (HRT) compared with complete exogenous thyroxine dependence in patients undergoing TT. However, due to the remaining goitrogenic tissue, hemi thyroidectomy has a higher recurrence rate [16]. With the exception of postoperative hypothyroidism, most complications post hemi thyroidectomy are relatively low. In this study, we aimed to assess the effect of hemi thyroidectomy on relief of compressive symptoms of thyroid disease.

### 1.1. Patient information

A retrospective database was used to analyze 38 Saudi patients (35 females and 3 males), mean age was 42 with a standard deviation of 14 years. Mean BMI was 27 with a minimum of 19 and a maximum of 35. All patients were referred from family physicians or endocrine clinics to the endocrine surgery clinic at King Khalid University Hospital. Patients

presented with one or more compressive symptoms such as shortness of breath (SOB), voice change, neck swelling, choking, orthopnea and dysphagia. Thirty-one patients had thyroid nodules (84%), with an average size of 2.6 cm (ranging from 0.8 to 7.3 cm), with most being in the right lobe (61%).

Out of 38 patients, 53% were medically free and 47% had comorbidities. Patients' surgical history was irrelevant to the patient's presentation. Most patients were working in a government sector 36%, followed by working in a private sector 31%, the least were housewives 28%. 61% are not taking any drugs, the rest are on hypertensive and/or diabetic medication. 72% have no allergies, 21% have environmental/seasonal allergies and only 5% have allergies from certain medications. 59% have no family history of any illness, diabetic and hypertension family history are 34% combined and only 5% of thyroid disease family history were detected in our data. Most of our patients were married 33% and the least were widowers 8%, the rest were divorced and single ladies with a percentage of 29% and 28%, respectively.

### 1.2. Clinical findings

During patients' first visit, 76.3% of patients had neck swelling while 23.7% didn't.

### 1.3. Timeline

All patients came with compressive symptoms as mentioned in Table 1. Symptoms first appearance till patients' first visit varied between patients but mainly within 6–8 weeks (see Table 2).

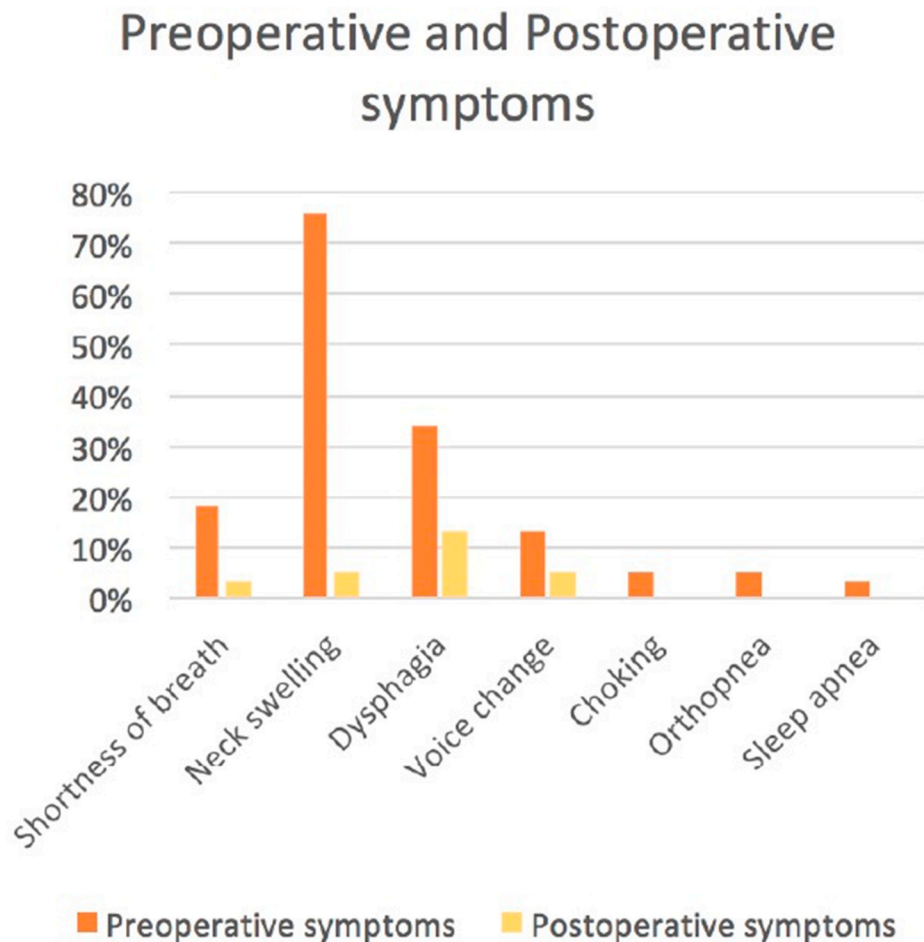


Fig. 1. Pre and post-operative symptoms

1.4. Diagnostic assessment

For each case, demographic data, baseline comorbidities, TSH levels prior to surgery, thyroid gland size, FNA results and pre-operative symptoms were recorded. Postoperative outcomes from two weeks to two years were recorded including the presence of compressive symptoms, the need for HRT and the need for completion surgery.

All patients that had compressive symptoms with preoperatively proven benign or indeterminate nodules were included. A multinodular goiter (MNG) is characterized by an increased thyroid gland volume with formation of nodules [17]. Preoperative assessment was made by complete history and examination, thyroid profile, ultrasonography (USG) and fine needle aspiration cytology (FNAC) as per the American Thyroid Association (ATA) guidelines [18]. All patients who have compressive symptoms had a US assessment done to assess the size of thyroid, the presence of any nodule. Nodules that met the criteria of FNA by American Thyroid Association (ATA) guidelines were biopsies. Bethesda grade 1-4 were included in our study, Bethesda 5-6 were treated as cancer and were excluded from our data even if HT was the intervention for them.

1.5. Intervention

38 patients who underwent elective hemi thyroidectomy (defined as lobectomy and isthmusectomy) for MNG at a tertiary hospital, King Khalid University Hospital from 2014 to 2018. All the procedures were operated by the same surgeon, Dr. Nuha Alsaleh. Written informed consent was obtained from the patients. The decision of choosing which lobe to resect depended on the location of the nodule (right or left lobe), and in cases of homogeneity, the larger lobe was resected.

All patients received routinely preoperatively dexamethasone 8 mg and mechanical DVT prophylaxis or pharmacological DVT prophylaxis if they met the VTE hospital guideline. Preoperative antibiotics were given if indicated by hospital guidelines for high risk patients. Also, pre-op routine analgesia and anti-emetic are usually given. Ligatures and electrocautery were used to help in thyroid resection.

Procedures were done Under GA with ET intubation and hypotensive anesthesia. The patient position was supine with neck extension and shoulder roll, collar incision was made with muscle splitting and retraction of strap muscle. Thyroid is mobilized medially and approached superiorly to inferiorly, followed by superior pole isolation

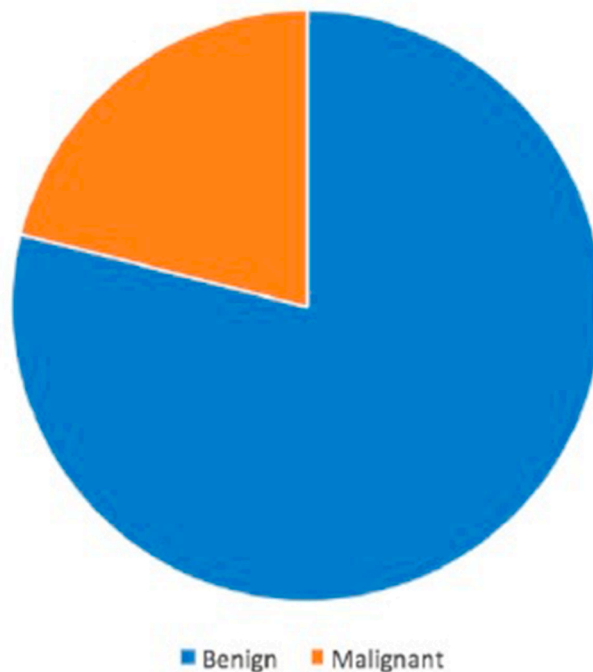


Fig. 3. Results of pathological specimens

and identification of RLN and its branches. Lastly but not least, removal of thyroid from trachea till midline and divided by ligatures, hemostasis checked twice with Valsalva maneuver. Strap muscles are approximated by vicryl and skin closed in lined using subcuticular incision.

Post operatively, voice is checked in the recovery area immediately, the patient will be on a clear fluid diet as tolerated, routine analgesia and anti-emetics. Patients will be sent home on the same day or after one day when no dysphagia or dysphagia are witnessed.

Patients will be seen in the clinic two weeks after for following up the symptoms and to discuss the pathology. Also, patients will be seen after 6 weeks to do TSH. The use of HT has been reported previously in some centers as definitive treatment for compressive symptoms and was described rarely in the literature [36].

• FNA:

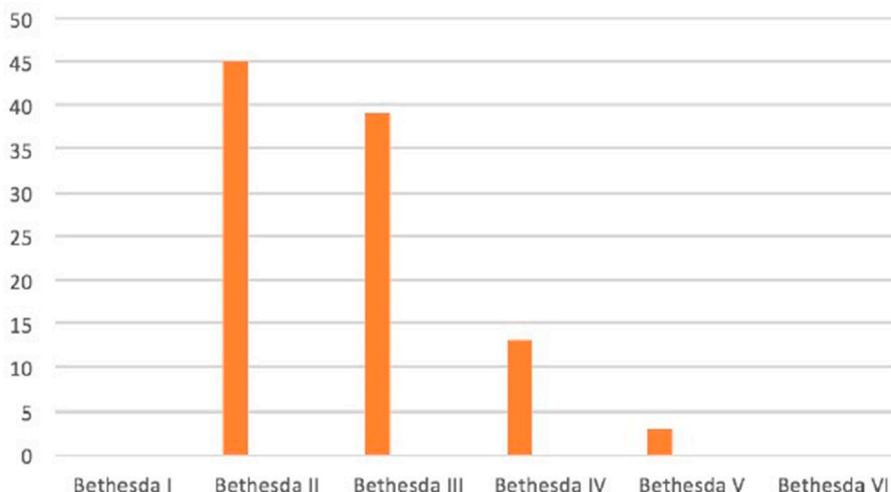


Fig. 2. Results of fine needle aspiration (FNA)

• Thyroxine replacement post-op:

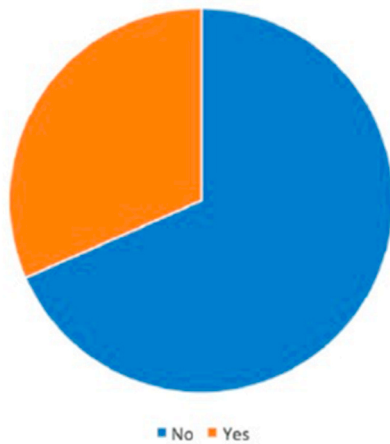


Fig. 4. Frequency distribution of thyroxine post-operative replacement

• Side of pathology:

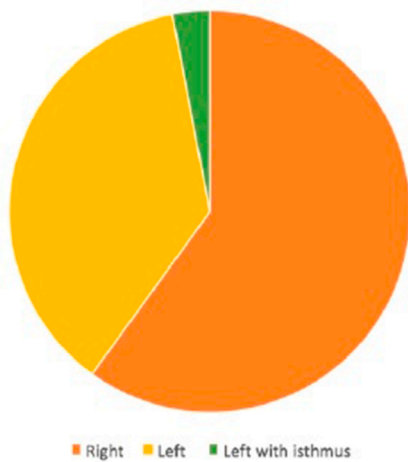


Fig. 5. Side of thyroid gland where the pathology occurred

Table 1  
Patient demographics.

	N	%
Total	38	100
Gender		
• Female	35	92
• Male	3	8
Age		
• 18-35	14	37
• 36-55	15	40
• >55	9	24
Past history		
• Medically free	20	53
• Comorbidities	18	47

Dr. Nuha Alsaleh is an experienced assistant professor, all cases were done by single surgeon Dr. Alsaleh, trained in endocrine surgery in New Orleans, Louisiana, USA after completing Canadian board in UFM Manitoba Canada.

Table 2

Comparison between preoperative and postoperative patient improvement and outcomes.

Variable		Pre-op		Post-op		Improvement		P-Value
		n	%	n	%	n	%	
Voice Change	No	33	86.8%	37	97.4%			0.113
	Yes	5	13.2%	1	2.6%	4	10.6%	
Neck Swelling	No	9	23.7%	36	94.7%			0.368
	Yes	29	76.3%	2	5.3%	27	71%	
Dysphagia	No	25	66%	33	86.8%			0.192
	Yes	13	34%	5	13.2%	7	20.8%	
Chocking	No	36	94.7%	38	100%			0.033
	Yes	2	5.3%	0	0.0%	2	5.3%	
SOB	No	31	81.6%	37	97.4%			0.033
	Yes	7	18.4%	1	2.6%	6	15.8%	
Orthopnea	No	36	94.7%	38	100%			0.033
	Yes	2	5.3%	0	0.0%	2	5.3%	

1.6. Follow up and outcomes

Postoperative outcomes from two weeks to two years were recorded including the presence of compressive symptoms, the need for HRT and the need for completion surgery. Resolution of compression symptoms, all patient's outcomes appear to be aligned with physicians expectations. Precautionary measures to prevent complications were antibiotics, thromboembolism prophylaxis as mentioned previously.

2. Methodology

A retrospective database was used to analyze 38 patients who underwent elective hemithyroidectomy (defined as lobectomy and isthmusectomy) for MNG at King Khalid University Hospital from 2014 to 2018, King Khalid University hospital is an academic tertiary center that belongs to King Saud University. All the procedures were operated by the same surgeon, Dr. Nuha Alsaleh. Written informed consent was obtained from the patients, The decision of choosing which lobe to resect depended on the location of the nodule (right or left lobe), and in cases of homogeneity, the larger lobe was resected. IRB approval number and clinical registry (IRB-934898-Skjd/09-2020) [http://www.KSU.com/clinical\\_registries/trials/caseseries](http://www.KSU.com/clinical_registries/trials/caseseries).

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Hypothyroidism was defined as a known diagnosis of hypothyroidism or a baseline serum TSH above the upper limit of normal at our lab (normal TSH range 0.34–4.8 µIU/ml). Similarly, postoperative hypothyroidism was defined as a serum TSH level greater than the upper limit of normal (4.8 µIU/ml) measured at least 6 weeks after surgery.

Ethical approval for this study was granted by the Institutional Review Board at King Saud University. Statistical analysis was performed with SPSS software (SPSS Inc.). Chi-square test and Student t-test were used for univariate analysis. Results were considered statistically significant when (p < 0.05). Work has been reported in line with the SCARE 2020 criteria [37].

### 3. Results

#### 3.1. Demographics

A total of 38 patients (35 females & 3 males) underwent hemi thyroidectomy for MNG with compressive symptoms from year 2014–2018. The mean age was 42 with a standard deviation of 14 years. Among these patients, 47% (n = 18) had comorbidities as shown in Table 1. Thirty patients (79%) had benign thyroid disease, and eight patients (21%) were found to have malignancy after resection. Thirty-one patients had thyroid nodules (84%), with an average size of 2.6 cm (ranging from 0.8 to 7.3 cm), with most being in the right lobe (61%).

#### 3.2. Postoperative complications

Patients were followed up for two years. All patients underwent pre- and postoperative laryngoscopy with proven bilateral mobile vocal cords. Compressive symptoms were assessed pre- and postoperatively. In 32 patients (84%), symptoms resolve completely and did not require a completion surgery. Out of the 29 patients that complained of neck swelling, only two continued to be bothered by this symptom postoperatively. Furthermore, patients who complained of orthopnea or choking reported that the symptoms resolved completely. Voice changes improved by 10.6% (13.2% pre-op and 2.6% post-op), and SOB significantly decreased ( $p = 0.033$ ) as shown in Table 1. Out of the 10 patients who had persistent symptoms, only two needed a completion surgery. Age, past history and thyroid pathology (benign or malignant) were independent from the resultant postoperative symptoms.

#### 3.3. Postoperative thyroid hormone replacement

Preoperatively, the majority of patients were euthyroid (92%), 1 patient was hypothyroid (3%) and 2 patients were hyperthyroid (5%). Postoperatively, 34.2% required thyroid replacement, 31.6% were euthyroid and 2.6% were hypothyroid preoperatively. Levothyroxine was used for all patients requiring replacement.

### 4. Discussion

The extent of resection in thyroidectomy for benign thyroid disorders is still a matter of debate, with management strategies ranging from hemi thyroidectomy to total thyroidectomy. The most important goal of surgery for goiter patients is symptomatic relief.

For a long time, total thyroidectomy was used to manage compressive symptoms and it carried a significant postoperative complication profile, including postoperative parathyroid failure, nerve injury and the need for lifelong thyroxine replacement. These complications have a negative impact on patients' quality of life which have been underestimated.

Hemi thyroidectomy on the other hand, offers a lower risk of complications, and preserves some of the thyroid gland's normal function. Life threatening complication rates in patients undergoing hemi thyroidectomy, such as postoperative hemorrhage and hematoma formation, were reported to be as low as 0.3% [13]. On the contrary, the risk was double in patients who underwent TT [13,19].

RLN injury rate in hemi thyroidectomy has reportedly fallen to 0–3%, and was observed only on the ipsilateral nerve, unlike in TT where it could be bilateral, carrying higher morbidity [19]. It is worth mentioning that with advancing surgical expertise, total thyroidectomy has been preferred by some surgeons owing to its lower recurrence rate, running as low as 0.5–3% [11,13,20,21].

The main drawback with hemi thyroidectomy is recurrence. Nevertheless, most recurrences post thyroid surgery are asymptomatic and are diagnosed on ultrasonography [22]. Risk factors that increase the incidence of recurrence that include young age at initial surgery, ineffective initial surgery, and multinodular nature of disease whether bilateral or

unilateral [8,23,24].

Overall, patients who undergo TT and hemi thyroidectomy see significant postoperative improvement in various aspects, including patient-reported swallowing and quality-of-life such as sleep and fatigue, among others [5,25,26]. In 2007, a two-year prospective study by Burns et al. showed that 80% of compressive symptoms were alleviated at the end of their follow up after hemi thyroidectomy. This resolution appeared to be independent of thyroid size [26]. This goes hand in hand with our present study, as we also found thyroid size was unrelated to postoperative resolution of symptoms.

We found that neck swelling and dysphagia had improved the most as expected; such that neck swelling was 76% preoperatively and 5% postoperatively, and dysphagia was 34% preoperatively and 13% postoperatively. This is followed by SOB and voice change, which were comparable at 18% and 13% preoperatively and 3% and 3% postoperatively, respectively.

Remarkably, none of our patients developed hematoma postoperatively. Moreover, orthopnea and choking had a 100% resolution rate postoperatively; however, only 2 patients had these symptoms preoperatively. Of note, none of our patients developed RLN injury evident on postoperative laryngoscopy.

Reported recurrence rates have not been consistent in the literature, with the average time for recurrence being 10–16 years. Not all patients who have recurrence require reoperation, it was reported that about 10% of patients with unilateral disease might develop recurrence in the long term, but only half will need surgical treatment [24,27,28].

During our two year follow up, our need to a reoperation was 5.2% (2 patients). Interestingly, the two cases were asymptomatic, and only detected on surveillance imaging. One of these was subsequently diagnosed with papillary thyroid cancer. Our findings were comparable to those of Philip et al. who reported a 2.4% recurrence rate after unilateral thyroidectomy and recommended unilateral resection for benign MNG [29].

The main aim of hemi thyroidectomy is to preserve part of the thyroid gland to allow production of endogenous thyroxine from the remaining glandular tissue. An estimated 1 in 7 patients will experience hypothyroidism and therefore will require HRT [16]. In a study conducted at Metro- Health Medical Center in Cleveland reported that hypothyroidism occurred in approximately one third of their patients (35%) following hemi thyroidectomy and only 9 out of 25 patients were symptomatic. They also revealed that hypothyroidism following hemi thyroidectomy is mild and can be treated with low doses of T4 [30]. This is in contrast to our study, where 34.2% required thyroid replacement, 31.6% were euthyroid and 2.6% were hypothyroid preoperatively [16, 31–34]. We attribute this to the prevalence of hypothyroidism in Saudi Arabia which reportedly stands at 47.34% [35].

In our study hemi thyroidectomy was effective treatment for compressive symptoms although was limited by the short follow up interval. We aim to conduct a similar study in the future with a longer follow up period as we continue recording follow up data.

#### Provenance and peer review

Not commissioned, externally peer-reviewed.

#### Ethical approval

IRB approval number and clinical registry (IRB-934898-Skjd/09-2020) [http://www.KSU.com/clinical\\_registries/trials/caseseries](http://www.KSU.com/clinical_registries/trials/caseseries).

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No funding source.



## Author contribution

Nuha conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript.

Maram designed the data collection instruments, collected data, carried out the initial analyses, and reviewed and revised the manuscript.

Last author conceptualized and designed the study, coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

## Registration of research studies

Name of the registry:

Unique Identifying number or registration ID:

Hyperlink to your specific registration (must be publicly accessible and will be checked):

. IRB approval number and clinical registry (IRB-934898-SkjD/09-2020) [http://www.KSU.com/clinical\\_registries/trials/caseseries](http://www.KSU.com/clinical_registries/trials/caseseries).

## Guarantor

Nuha Alsaleh, MD.

## Consent

All the procedures were operated by the same surgeon, Dr. Nuha Alsaleh. Written informed consent was obtained from the patients, The decision of choosing which lobe to resect depended on the location of the nodule (right or left lobe), and in cases of homogeneity, the larger lobe was resected. IRB approval number and clinical registry (IRB-934898-SkjD/09-2020) [http://www.KSU.com/clinical\\_registries/trial/s/caseseries](http://www.KSU.com/clinical_registries/trial/s/caseseries).

## Declaration of competing interest

No conflict of interest.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2021.01.088>.

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