

## Endoscopic Thyroidectomy: Experience of Breast and Axillary Approach

Gyan Chand<sup>1\*</sup>, SK Mishra<sup>1</sup>,  
Ashok Kumar<sup>2</sup> and  
Suman Vimal<sup>1</sup>

### Abstract

**Background:** The use of endoscopic thyroid surgical procedures leads to avoid the surgical scar in the neck. In this paper we evaluate the merits and limits of endoscopic thyroid surgery through breast and axillary approach.

**Methods:** Between Aug 2013 and Nov. 2014, 437 thyroid surgeries were performed. 27 of them were operated endoscopically through axillary and breast approaches were reviewed prospectively. Three ports were used in this technique, two in axilla and one in ipsilateral areola. Carbon dioxide insufflation up to 6-8mm Hg was used.

**Results:** Endoscopic procedures performed in 27 patients (22 hemi thyroidectomy and 3 total thyroidectomy and one completion thyroidectomy). The mean operating time for hemi thyroidectomy and total thyroidectomy was 148 and 270 minutes respectively. No evidence of recurrent laryngeal nerve injury was observed in any case however there was temporary hypocalcaemia in all four patients operated as total thyroidectomy. The postoperative cosmetic status of the patients was excellent.

**Conclusions:** We believe that endoscopic thyroidectomy by axillary & breast approach will find a role in the treatment of nodular thyroid disease with excellent cosmetic outcome.

**Keywords:** Endoscopic thyroidectomy; Thyroidectomy via axillary approach; Thyroidectomy via breast approach; Minimally invasive thyroid surgery

- 1 Department of Endocrine Surgery, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Rae Bareilly Road, Lucknow, Uttar Pradesh, India
- 2 Department of Genetics, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Rae Bareilly Road, Lucknow, Uttar Pradesh, India

\*Corresponding author: Gyan Chand

✉ drgyanchandpgi@gmail.com

Department of Endocrine Surgery, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Rae Bareilly Road, Lucknow, Uttar Pradesh 226014, India.

Tel: 0522 266 8700

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### Introduction

Conventional open thyroidectomy remains the treatment of choice for benign and malignant thyroid tumors since ages, the open thyroid surgical procedures leaves a scar line in the lower anterior neck. This incision line sometimes may developed in to dark scars, hypertrophic scars keloid and may lead to parasthesia and hyperesthesia [1].

After the advancement in technology of laparoscopic and endoscopic surgery, thyroid and parathyroid surgery has been attempted using endoscopic approach. Since endoscopic parathyroidectomy and thyroidectomy were first introduced by Gagner and Huscher et al [2,3], various endoscopic thyroid surgery approaches have been devised, including direct cervical surgical approach (anterior or lateral cervical), extracervical access (chest wall, breast, or axilla) and a combination of approaches during last two decades [4-15].

Endoscopic thyroid surgical technique is still in early stage and it is almost establish in patients with benign thyroid nodules. After the surgical experience was accumulated, the application of endoscopic thyroidectomy was extended to patients with early thyroid cancer.

In this study we have reviewed our experience of endoscopic thyroid surgery through ipsilateral breast and axillary approach (IBAA). The purpose of this study is to evaluate the feasibility, safety and outcome of endoscopic thyroid surgery through this approach and to analyze the clinic-pathological features, duration and complications in our patients.

### Methods

Between July 2013 to June 2016, 41 patients underwent 43 procedures of endoscopic thyroid surgery through ipsilateral breast and axillary approach at our department was included in

this study. All procedures were performed by single surgeon and retrospectively analyzed.

All patients presented with visible goiter in the neck, routine preoperative diagnostic investigations were performed, including ultrasound neck, fine needle aspiration cytology and thyroid function test. All patients were explained about surgical procedure, possible complications and the possibility of conversion from endoscopic to open thyroidectomy. The informed consent was obtained from all the patients before surgical procedure. All patients were opted for endoscopic thyroid surgery.

## Patients' selection criteria

### Inclusion criteria:

1. Motivated patients (committed to scar free neck)
2. Dominant thyroid nodule size <6cm in greatest diameter
3. Benign on thyroid cytology
4. Normal thyroid function test
5. Ability to understand the surgical options and provide informed consent
6. No previous neck surgery

### Exclusion criteria:

1. Preoperative diagnosis of thyroid cancer
2. Presence of cervical lymph nodes
3. Big nodules and compression on trachea
4. Retrosternal extension
5. Previous neck and chest surgery
6. Abnormal thyroid function test

### Surgical procedure

All patients were operated under general anesthesia with single lumen flexometallic endotracheal tubes. They were put on supine positions at 30 degree reverse trendelenburg position with sandbag under the shoulder. The ipsilateral arm was extended up to 90°-120°. Incision sites were marked. A diluted epinephrine solution (1:200000) was injected into the anterior chest wall and cervical area (**Figure 1**). Three incisions for ports were made; two were in axilla at anterior axillary line and one in superior-medial circumareolar site on ipsilateral breast. First 12mm port was inserted through axillary incision blindly towards the thyroid cartilage; withdraw it about half of its length, so a blind space was created into subcutaneous plane. It was connected with CO2 insufflations at 6 to 8mm Hg and thirty degree telescope was inserted. Another two ports were now placed directing to this tunnel and subcutaneous plane was created under vision with scissor connected with electro cautery (**Figure 2**).

Subplatysmal adequate working space was created from thyroid cartilage superiorly to sternal notch inferiorly then dissected the sternohyoid and sternothyroid muscles from thyroid lobe from lateral side. The



**Figure 1** Position and skin marking of incision sites.



**Figure 2** Port Positions during surgery.

sternohyoid and sternothyroid muscles were dissected from each other than the upper end of sternothyroid muscle was resected using 5-mm ultrasonic vessel sealing device (SonoSurg; Olympus, Japan). The inferior pole of thyroid mobilized first by coagulation and cutting of inferior polar vessels. It was followed by lateral mobilization of thyroid lobe and carefully visualization and preservation of parathyroid glands and recurrent laryngeal nerve. Thyroid isthmus was then resected and in last the upper pole of thyroid lobe was dissected. Finally gland put into endobag and delivered through axillary port incision and closed the wound with negative pressure drain in situ.

The extent of surgery, size of gland, weight of gland and duration of surgery was recorded. Post-operative care was same as conventional open thyroid surgery. The hypocalcaemia, voice change, hemorrhage and hospital stay was noted. We checked the serum ionized calcium on first postoperative day morning

and we define the postoperative hypocalcaemia as serum ionized calcium levels <4.6mg/dl (ranges from 4.6-5.3mg/dl), with or without clinical symptoms of hypocalcaemia or positive Trousseau's sign with subnormal serum ionized calcium levels (4.6-5.3mg/dl). During follow-up final histopathology and cosmetic outcome was evaluated (**Figure 3**).

## Results

Between July 2013 to June 2016, total 41 patients were operated endoscopically using ipsilateral breast and axillary approach, two patients were operated twice for completion total thyroidectomy endoscopically. The clino-pathological characteristics are described in **Table 1**. Mean duration of goiter was 2.2 years (range 1 month to 8 years). On thyroid function test all were euthyroid. 37 patients were operated successfully endoscopically however four patients were converted to open surgery due to intractable bleeding from the thyroid surface and from the upper pole. No frozen biopsy was send during surgery however two patients underwent completion total thyroidectomy endoscopically after the final histopathology turns out to follicular thyroid carcinoma. Three patients diagnosed as papillary thyroid carcinoma on final histopathology was underwent completion total thyroidectomy and central neck dissection by conventional open techniques. The mean duration of surgery for hemithyroidectomy was 139.24 minutes and for total thyroidectomy was 243.33 minutes. In Hemithyroidectomy groups the mean tumor size was 4.21cm, the mean tumor weight was 17.15gm, and the mean hospital stay was 2.49 days (range 1 to 7 days).

The postoperative complications includes temporary voice change noticed in two hemi thyroidectomy patients however temporary hypocalcaemia was noticed on postoperative day two, in two patients who underwent endoscopic total thyroidectomy, managed with oral calcium. One patient underwent endoscopic completion total thyroidectomy and two patients which were converted to open, developed temporary postoperative

**Table 1** Clinico-pathological characteristics.

Clinico-pathological characteristics	Value (N=41)
Age (Years)	32.85 (range, 16-70)
<b>Gender</b>	
Male	7
Female	32
<b>Tumor size</b>	
Upto 3cm	05
>3-4cm	13
>4-5cm	14
>5-6cm	10
<b>Preoperative FNAC diagnosis</b>	
Colloid nodule	33(80.5%)
Follicular lesion	5(12.2%)
Hurthle cell lesions	3(7.3%)
<b>Final Histopathological diagnosis</b>	
Colloid nodule	26 (63.41%)
Follicular adenoma	07(17.07%)
Hurthle cell adenoma	01(2.44%)
Thyroiditis	02(4.88%)
Carcinoma	05(12.20%)
FVPTC	02(4.88%)
TCVPTC	01(2.44%)
WIFTC	01(2.44%)
MIFTC	01(2.44%)
<b>Surgical procedure</b>	
Hemi thyroidectomy	34(79.16%)
Total thyroidectomy	3(6.98%)
Completion total thyroidectomy	2(4.65%)
Converted to Open	4(9.30%)

biochemical hypocalcaemia and they were managed with oral calcium.

The post-operative pain was relived on 1st to 3rd days after surgery and mean duration of drain was 3-4 days after surgery. The sarcoma was noticed in the neck in few cases. On follow-up visit from 04 month to 40 months, suggested that none had hypocalcaemia or recurrent nerve palsy. The patients have excellent cosmetic outcome in follow-up visits.

## Discussion

The first endoscopic thyroid surgery for 5 to 7cm adenoma was performed by Oghami et al using three port technique, two in circumareolar and one in parasternal position 10, In this technique there was a scar in anterior chest wall and then Ikeda et al. applied chest and axillary approach for thyroid adenoma, Grave's disease, and papillary micro carcinoma [10,13]. Shimazu et al modified this approach to axillary- bilateral breast approach for endoscopic thyroidectomy [16]. Endoscopic thyroid surgery has generally been thought to be appropriate for benign thyroid disease, although endoscopic thyroid surgery is also feasible for Grave's disease and well-differentiated thyroid carcinoma in some selected patients [17-19].

Present study composed of endoscopic thyroid surgery for clinically euthyroid benign goiters, out of 41 patients, majority have solitary thyroid nodule. The basic principle of thyroid surgery was same during this technique of endoscopic surgery, such as capsular dissection, identification and preservation of



**Figure 3** Postoperative results after 6 months.

parathyroid and recurrent laryngeal nerves so the operation can be performed safely. This study showed that endoscopic thyroidectomy via breast and axillary approach has learning curve. The majority of patients were young (20-30 years of age), and they reported thyroid nodule early (33% reported within six months duration) and more than 50% had <4cm thyroid nodule in size.

The complications rate in this technique was minimal such as five patients (11.63%) did experience transient hypocalcaemia and two patient (4.65%) experienced transient recurrent laryngeal nerve palsy however none of patient noticed permanent hypocalcaemia or recurrent laryngeal nerve palsy on subsequent follow-up visits. The cause of hypocalcaemia and recurrent laryngeal nerve palsy in these patients might be caused by lateral thermal spread by the ultrasonic coagulation devices [20].

The rate of conversion to open has been reported at 0-13% 21 the main reasons for conversion to open surgery are hemorrhage, difficult dissection, tumor size, thyroiditis and tracheal injury [21]. In present study, four patients were required conversion to open because of bleeding from surface of nodule and from the superior thyroid vessels.

Our endoscopic thyroidectomy approach has several potential weaknesses in terms of operative time, hospital stay and invasiveness. It should achieve the same result as conventional surgery with additional advantage of shorter hospital stay, less postoperative pain and excellent cosmetic results especially in young women. In current series the cosmetic result was excellent; however we required more extensive dissection to create working space therefore the dissection was not truly minimally invasive. Recently Wong et al. reported the chest wall approach did not

differ significantly from conventional thyroid surgery in terms of producing inflammatory markers like interleukin-6, tumor necrotic factor, C-reactive protein and cortisol, which indicate the degree of surgical damage [22].

Yeung et al concern about scar around the nipple, especially in western women [23]. Therefore surgeons from western countries favor endoscopic neck surgery through trans axillary approach, however trans axillary has several drawbacks including, lateral approach to thyroid, narrow working space, long scar in axilla and contralateral lobectomy requires ipsilateral approach [24]. In our series' most of our patients were satisfied with their nipple scar.

There are chances of potential adverse effect due to carbon dioxide insufflation in surgical working space with some reports of subcutaneous emphysema [25]. However no adverse effect has been reported in our series with using carbon dioxide at low pressure (7 mm Hg) with high flow rate (7 L/min). This high flow helps us in maintain the working space during carbon dioxide gas loss, either due to frequent use of suction to clear smoky field produced by electric cautery or when ports are not airtight fully.

In conclusion, endoscopic thyroidectomy by the breast and axillary approach in selected patients with benign thyroid disease is an effective procedure and allows excellent cosmetic results. This method is a valid option to the selected group of patients who do not want visible scar in the neck.

## Conflict of interest

Authors have no conflict of interest.

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