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Original Article

Transaxillary Endoscopic Hemithyroidectomy versus Open Hemithyroidectomy for Solitary Thyroid Nodule: A Randomized Study

R Pari Muthukumar[1], Vineeth Vishwanath[2], Apoorva Prathap[3], Mohammed Ibrahim[3]

[1]Assistant Professor, Department of General Surgery, Sri Ramachandra Medical College, Porur, Chennai, Tamil Nadu, India, [2]Student, Department of General Surgery, Sri Ramachandra Medical College, Porur, Chennai, Tamil Nadu, India, [3]Resident, Department of General Surgery, Sri Ramachandra Medical College, Porur, Chennai, Tamil Nadu, India

Abstract

Introduction: Traditional thyroidectomy technique approaches the thyroid through a transverse incision over the neck. The scar may result in hyperesthesia, restriction of neck movements, and increased patient self-consciousness. Furthermore, in some patients, it can result in hyperplastic or keloid scar formation. Minimally invasive techniques have replaced open surgeries in many surgical fields. Endoscopic transaxillary thyroidectomy is one such minimally invasive technique that may provide superior cosmetic results for patients needing thyroidectomy.

Materials and Methods: We did a randomized study comparing endoscopic transaxillary versus traditional open hemithyroidectomy approach in case of a solitary thyroid nodule. We reviewed our series of 57 patients and studied the feasibility and safety of transaxillary endoscopic approach in patients who have undergone hemithyroidectomy between the years 2012 and 2015.

Results: The total operative time for the transaxillary endoscopic hemithyroidectomy (TAEHT) is longer compared to the open group. Total operating time was calculated from the time of skin incision to closure. Mean operating time in transaxillary endoscopic group is 132 min and mean operating time in open hemithyroidectomy group is 102.03 min. In comparison, the mean operating time in open hemithyroidectomy is 45.4 ± 11.90.

Conclusion: TAEHT is safe and feasible. However, there is a slight increase in operative time. We also conclude that transaxillary endoscopic thyroidectomy is superior to conventional open hemithyroidectomy in terms of post-operative pain, duration of stay, seroma formation, and cosmesis.

Key words: Endoscopic thyroidectomy, Minimally invasive thyroid surgery, Transaxillary thyroidectomy

INTRODUCTION

Minimally invasive surgeries have replaced open surgeries in many surgical fields. Initiation of laparoscopic cholecystectomy by Reynolds[1] revolutionized the surgical department worldwide. Followed by that, almost all intra-abdominal surgeries were done laparoscopically.

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The advantages of surgery performed using minimally invasive techniques in other areas of the body have been well documented. Enhanced cosmesis, optical enhancement, and improved visualization through video magnifications have inspired the use of an endoscopic approach to the thyroid and parathyroid glands as well.

The traditional thyroidectomy technique approaches the thyroid through a transverse incision in the neck. The scar may result in hyperesthesias, restriction of neck movements, and increased patient self-awareness. Furthermore, in some patients of darker skin ethnicity, it can result in hyperplastic and keloid scar formation in a highly visible area of the neck.

Corresponding Author: Dr. Apoorva Prathap, Resident, Department of General Surgery, Sri Ramachandra Medical College, Porur, Chennai - 600116, Tamil Nadu, India. Phone: +91-9840633842. E-mail: apoorvaprathap90@gmail.com

The subject of "endoscopic thyroidectomy" has generated immense interest among thyroid surgeons. Since the first report of endoscopic parathyroidectomy reported by Gagner *et al.*,[2] in 1996, various minimally invasive approaches have been described in the literature for endoscopic thyroidectomy.

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We did a comparative study between endoscopic transaxillary versus traditional open hemithyroidectomy approach in case of solitary thyroid nodules. We reviewed our series and studied the feasibility and safety of transaxillary endoscopic approach in patients who have undergone hemithyroidectomy.

MATERIALS AND METHODS

All patients undergoing hemithyroidectomy (open and minimally invasive) for solitary thyroid nodules for 3 years in the Department of General Surgery, Sri Ramachandra University, were included in the study.

All benign solitary thyroid nodules of size 5 cm or less, as confirmed by ultrasonography (USG) and fine-needle aspiration cytology (FNAC), in patients 18 years or above of age were included in the study. Malignant, recurrent nodules, and patients with American Society of Anaesthesiologists >3 were excluded from the study.

All the patients underwent thorough clinical examination after registration. Hematological (complete blood count) and biochemical (random blood sugar, renal function test, and serum electrolytes) evaluation, Skiagram neck (antero-posterior and lateral view), thyroid function tests, and coagulation profile were done for all cases. Electrocardiogram was done for those who were above 40 years.

All the patients were subjected to indirect laryngoscopy done by otorhinolaryngologists. All patients included in the study were subjected to FNAC and USG neck.

All 57 patients included in the study were subjected to one of the surgeries mentioned earlier. Of the 57 patients, 26 underwent transaxillary endoscopic hemithyroidectomy (TAEHT), and 31 patients underwent traditional open thyroidectomy selected randomly. 12F suction drain was placed in both groups. The following parameters were compared between both groups. Duration of surgery was documented in all cases. Post-operative pain score was recorded on post-operative day (POD) 1, 3, and 7 using visual analog scale.

Post-operative drain, seroma, recurrent laryngeal nerve (RLN) damage, and duration of hospital stay were also studied. Patients' post-operative histopathology reports were taken into consideration.

RESULTS

The various parameters were recorded in Tables 1-8.

Table 1: Age

Group	*N*	Mean	Standard deviation	Standard error mean
Open	31	31.38	7.481	1.230
TAEHT	26	29.00	6.190	1.214

TAEHT: Transaxillary endoscopic hemithyroidectomy

Table 2: Sex (Male: Female)

Sex	Open	TAEHT	Total
Male	2	1	3
Female	29	25	55

TAEHT: Transaxillary endoscopic hemithyroidectomy.

Table 3: Duration of surgery

Group	*N*	Mean (min)	Standard deviation	Standard error mean
Open	31	102.03	16.093	2.646
TAEHT	26	132.65	7.445	1.460

TAEHT: Transaxillary endoscopic hemithyroidectomy

Table 4: Post-operative day 1

Group	*N*	Mean	Standard deviation	Standard error mean
Open	31	3.38	0.594	0.098
TAEHT	26	2.00	0.0001	0.0001

TAEHT: Transaxillary endoscopic hemithyroidectomy

Table 5: Post-operative day 3

Group	*N*	Mean	Standard deviation	Standard error mean
Open	31	2.57	0.603	0.099
TAEHT	26	1.00	0.0001	0.0001

TAEHT: Transaxillary endoscopic hemithyroidectomy

Table 6: Post-operative day 7

Group	*N*	Mean	Standard deviation	Standard error mean
Open	31	1.27	0.450	0.074
TAEHT	26	0.20	0.408	0.082

TAEHT: Transaxillary endoscopic hemithyroidectomy

Table 7: Duration of hospital stay

Group	N	Mean (days)	Standard deviation	Standard error mean
Open	31	3.84	0.646	0.106
TAEHT	26	2.42	0.643	0.126

TAEHT: Transaxillary endoscopic hemithyroidectomy

Table 8: Post-operative drain

Group	N	Mean (ml)	Standard deviation	Standard error mean
Open	31	19.46	10.235	1.683
TAEHT	26	13.42	6.760	1.326

TAEHT: Transaxillary endoscopic hemithyroidectomy

DISCUSSION

Benign thyroid nodules can be treated by various modalities. The main objective for minimally invasive thyroid surgeries in all studies is cosmesis, lesser pain, and lower/equal morbidity compared to the open approach. A meta-analysis study done by Chen et al showed that minimally invasive thyroid surgeries have improved outcomes in terms of pressure symptoms and cosmesis when compared to other modalities.[3] We did a comparative study between conventional open hemithyroidectomy and TAEHT in terms of cosmesis, post-operative pain, duration of stay, duration of surgery, and complications. We have compared our observation with the studies conducted by Feilin *et al.* and Bhargav *et al.*

Study done by Feilin *et al.*[4] was a comparative study, in which endoscopic thyroidectomy was done through breast approach. They included both hemithyroidectomy as well as total thyroidectomy in their study whereas the present study compares only hemithyroidectomy. They use CO_2 insufflation to maintain the working space in endoscopic thyroidectomy group similar to the present study. A study done by Bhargav *et al.*[5] evaluated the feasibility and safety of single-incision TAEHT without using CO_2 insufflation. They included both hemithyroidectomy as well as total thyroidectomy, wherein total thyroidectomy, the other side is approached through the contralateral axilla. In this study, we have excluded malignant or recurrent nodule and size of the nodule >5 cm. This exclusion criterion is similar to the studies mentioned above.

The age of the patients in present study varies in a range form 21 to 45 years. Mean age was 31. 38 years in conventional open hemithyroidectomy group and it was 29 years in TAEHT group. This is comparable with the studies mentioned above.

Female: Male ratio in the present study was 4:1. The majority of the patients were females, which correlates with the other studies reviewed. Female:Male ratio 14:2 in study done by Bhargav *et al.*[5]

The main interest of present study as mentioned before was to compare the TAEHT versus open hemithyroidectomy in terms of duration of surgery, post-operative pain, complications, and cosmetic outcome.

The total operative time for the TAEHT is longer compared to the open group. Total operating time was calculated from the time of skin incision to closure. Mean operating time in transaxillary endoscopic group is 132 min, and mean operating time in open hemithyroidectomy group is 102.03 min. In comparison, the mean operating time in open hemithyroidectomy is 45.4 ± 11.90 versus 79.9 ± 20.10 min in endoscopic hemithyroidectomy in a study done by Feilin *et al.*[4] The mean operative time in the study done by Bhargav *et al.*[5] is 123.4 min. In Gagner[2] study, mean operative time for his anterior cervical approach is 220 min.

There was no conversion to open in the endoscopic thyroidectomy group. On comparison, there is no conversion in other studies noted as well.

RLN was identified in all cases in both open and endoscopic group. Endoscopic approach provides better, magnified views of the RLN and the parathyroid gland resulting in fewer complications.

Post-operative drain amount is quantified in both open and endoscopic groups. 12F suction drain is placed in both groups. Drain is removed on POD 2 in both groups. Mean drain amount in open group is 19.46 ml, whereas in transaxillary endoscopic group is 13.42 ml. The study by Bhargav *et al.*[5] states that there was prolonged drainage (5.4 days) postoperatively, which again increases the hospital stay. This is due to extensive dissection due to gasless technique, which is restricted in our technique due to gas insufflation.

Mean duration of stay in open hemithyroidectomy group is 3.84 days, whereas, in transaxillary endoscopic thyroidectomy group, it is 2.42 days. There is a significant reduction in duration of stay. Mean duration of stay is 5.3 days in a study done by Bhargav *et al.*,[5] whereas, in a study done by Chantawibul *et al.*,[6] duration of stay is 2.9 days.

There is a significant reduction in post-operative pain in TAEHT as compared to the open group. Pain score is documented on POD 1, 3, and 7 using visual analog scale.

Once post-operative wound collection occurs, the options are continued observation in the hope of gradual spontaneous resolution, needle aspiration, and evacuation of wound collection under local or general anesthesia. Collections that occur in the immediate post-operative period are due to continued or delayed bleeding from

the wound. At this stage, usually surgical intervention is required unless the bleeding is minimal. Later in the post-operative course, tissue fluid can collect in the operated area and give rise to a seroma. This can be aspirated with a needle or observed without any intervention. We record it as seroma if there is intervention done for it to reduce.

Seroma formation post drain removal was noted more in open thyroidectomy. Some studies quote that the extensive dissection in the transaxillary approach leads to more seroma formation. This depends on whether CO_2 insufflation is used or not. The use of CO_2 provides good operating space, hence reducing the amount of dissection. Insertion of only the working ports and minimal dissection greatly minimized the amount dissection on our patients and the incidence of seroma formation was nil.

In conventional open approach, the gland is reached through a range of variably sized collar neck incisions in the neck, which can result in a scar with hyperesthesia, paresthesia, and increased patient self-awareness. Furthermore, keloid or hypertrophic scar worsens the cosmetic outcome, especially in dark-skinned individuals. Restriction of neck movements and some amount of dysphagia is also noted in some patients undergoing open hemithyroidectomy.

The transaxillary approach utilizes an access through the axilla, thus avoiding a cervical or chest wall incision. This is especially true in the case of benign thyroid nodules, which is common in the young female population. Patients who underwent transaxillary endoscopic thyroidectomy were extremely satisfied with the scar in the axilla compared to the conventional open group. The subsequent scar is hidden in the axilla and remains under clothing. If the patient is prone to hypertrophic scar formation, the final scar will be well hidden within the axilla and quite amenable to scar modification.

CONCLUSION

In this study, we conclude that TAEHT is safe and feasible. However, there is a slight increase in operative time. We also conclude that transaxillary endoscopic thyroidectomy is superior to conventional open hemithyroidectomy in terms of post-operative pain, duration of stay, seroma formation, and cosmesis.

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