

Minimally Invasive Thyroidectomy: A Review Article

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Abstract

Introduction: Various techniques of minimally invasive thyroidectomy (MIT) have been practiced by the surgeons in the recent past to extrapolate the proven benefits of minimal access Surgery even with regard to various diseases of the thyroid gland. This article aims to review the benefits of various techniques of MIT over conventional open thyroidectomy in terms of morbidity, complication rate, and cosmetic outcome.

Materials and Methods: This is a retrospective study reviewing various articles and publications in reputed magazines by downloading them using different search engines. Only the material relevant to the objectives of this article was reviewed.

Results: Cosmetic outcomes were excellent, post-operative pain was less, the duration of hospital stay was very much less with MIT when compared with conventional thyroidectomy. Other complication rates are comparable. Operative times were significantly longer for MI video-assisted thyroidectomy (MIVAT) or Endoscopic thyroidectomy and Robotic endoscopic thyroidectomy (BABA technique).

Conclusion: MIVAT and MI endoscopic thyroidectomy especially the anterior chest wall approach are safe and effective with excellent cosmetic outcome in the hands of well-trained Surgeons when compared to conventional thyroidectomy. It is possible now to remove large nodules and even perform a total thyroidectomy with endoscopic thyroidectomy procedures.

Key words: Endoscopic, Minimally invasive, Robotic, Thyroidectomy

INTRODUCTION

Rapid developments in video laparoscopic surgery have been observed in past several decades. Thyroidectomies performed by open method are well-effective, tolerable, and safe, but it involves transverse incision on the neck measuring 7-10 cm in length. These thyroid disorders are pretty common among women's and the scars due to incision make them uncomfortable and cosmetically unacceptable.¹

Minimally invasive (MI) methods are now widely used in various medical fields. Now MI can even be used for performing endocrine surgeries. These MI thyroid procedures can be subdivided into three subgroups:

(1) Endoscopic access from a small lateral incision in the neck, (2) video-assisted methods using a central incision-MIVAT and (3) range of endoscopic methods. MI procedures are precisely indicated and defined. Video-assisted methods using a central incision consequently represent a safe method that involve less trauma to tissue, a short period of hospitalization and appreciable cosmetic benefits for the patient. Hence, these MI surgeries are playing an ever increasing role in neck surgery.²

Objective of Review

This review aimed to know the outcome of MI video-assisted thyroidectomy (MIVAT) and to compare complications between the MIVAT and few other conventional thyroidectomy MI endoscopy approaches.

MATERIALS AND METHODS

This review is prepared by downloading the articles from several search engine like PubMed, Medline, Scopus, EbscoHost, etc.

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Only articles pertaining to and relevant to MIVAT, MI endoscopic thyroidectomy via different approaches and also early experiences with Endoscopic Thyroidectomy with Da Vinci Robot system using Bilateral Axillary Breast Approach (BABA) in comparison with that of conventional thyroidectomy are included in this study.

Factors such as operative time, cosmetic outcome, complications, length of hospital stay, and post-operative pain were evaluated.

RESULTS

Hegazy, *et al.* studies total 68 patients and compared the MIVAT versus that of MI open surgery (Sofferman technique). The two groups were comparable to the extent of the surgery age, gender of the patient. The study concluded that the MIVAT group had a longer operative time (115.4 ± 33.5 min) as compared to the open technique group (65.6 ± 23.7 min). The post-operative pain was comparatively less in the MIVAT group ($P < 0.05$) than the open technique group. However, no significant difference was obtained in relation to cosmetic outcome in both group ($P < 0.05$).²

Chung *et al.* conducted study involving 301 patients. They evaluated the completeness of thyroidectomy and comparing the complications of endoscopic thyroidectomy with conventional open thyroidectomy. They came to conclusion that there was no statistical significance in the sets of parameters like: No difference in post-op thyroglobulin levels, no difference in the occurrence of vocal cord paralysis and no difference in the incidence of hypocalcaemia between the two groups. Furthermore, they stated that cosmetic outcome was excellent in the video-assisted group. Moreover, mean hospital days were lower in the endoscopic thyroidectomy group (mean 3.04 days) as compared to the open technique group (mean 3.18 days).³

Bellantone *et al.* evaluated 62 patients comparing the video-assisted versus conventional thyroid lobectomy. Parameters like cosmetic outcome, post-operative pain, complications (bleeding, infection, recurrent nerve palsy) were taken into consideration. They noted that the patients who underwent video-assisted surgery were more satisfied with the cosmetic outcome (mean \pm standard deviation [SD], 9.2 ± 0.5) as compared to the open conventional surgery (mean \pm SD, 5.8 ± 0.2) ($P < 0.001$). Furthermore, the post-operative pain was significantly lower than the open surgery group in the video-assisted group ($P < 0.001$). The duration of hospital stay was lower in the video-assisted group (mean \pm SD, 1.1 ± 0.1 days) as compared to open surgery group (mean \pm SD, 2.2 ± 0.2 days), but was found not statistically significant.⁴

Ujiki *et al.* conducted study on 48 patients to compare the video-assisted thyroidectomy versus conventional thyroidectomy. They concluded that operative time is longer in the MIVAT group (mean \pm standard error of mean, 102 ± 4 min) as compared to conventional group (86 ± 3 min) and it was not statistically significant ($P < 0.05$). Analgesic requirements found no significant difference between the both the groups ($P < 0.05$).⁵

In a study conducted by Shailesh *et al.*, 15 patients were taken. Of these, thyroid lobectomy was performed on 8 cases, total thyroidectomy on 3 cases, and subtotal thyroidectomy in 4 cases. The average blood loss was 20 ml (range 15 ml-35 ml). Mean operative time was 85 min (range 60-120 min). There were no complications and no cases were converted to open. There were no subcutaneous emphysema, ecchymosis or hypercarbia and no cases of recurrent laryngeal nerve palsy or post-operative tetany observed in any patient. Patients were discharged on the 2nd post-operative day. The suprasternal incision was widened to a mean size of 5.6 cm (range 2-7.5 cm) for removal of the specimen. However, this scar was well hidden beneath the clothes of the patients, and all patients were satisfied with the cosmetic result of the surgery.⁶

In a study of Hiroshi and Yoshifumi, 22 patients were treated by the anterior chest approach to endoscopic thyroidectomy and 28 patients by the axillary approach. The only complication was one case of post-operative emphysema. The patients were satisfied with the cosmetic results of the procedures and the minimal degree of post-operative hypesthesia, paresthesia, and discomfort.⁷

In another article of Radford *et al.* five trials were identified. The total number of patients was 318. Primary outcomes that were measured were pain, hypocalcemia (post-operatively) and post-operative recurrent laryngeal nerve palsy. Along with this, there was no difference in rates of post-operative hypocalcemia or post-operative recurrent laryngeal nerve palsy between the techniques. Reported pain scores at 24 h were significantly lower in MIVAT compared to conventional surgery. Pooled effect size was -4.496 (95% confidence interval [CI] = -7.146 – -2.045 , $P = 0.0004$). Secondary outcome measures were operative time, blood loss, and cosmesis. There was a significant improvement in patient reported scores for cosmesis with MIVAT. The pooled effect size was 3.669 (95% CI 0.636 – 6.702 , $P = 0.0178$). MIVAT was associated with a significant increase in operative time. Pooled effect size was 1.681 (95% CI 0.600 – 2.762 , $P = 0.0023$). No statistical difference in blood loss between the groups was observed.⁸

Lee *et al.* conducted study of endoscopic thyroidectomy using the BABA with the Da Vinci Robot system between

March and May 2008. 15 patients diagnosed with papillary thyroid cancer underwent robotic-assisted endoscopic thyroidectomy using the BABA technique. The mean operating time was 218 min. Steady decrease in operative time from the initial case to the 15th case was observed. The blood loss was minimal. The recurrent laryngeal nerve and parathyroid glands were identified in great detail with ease and preserved in all cases. There were no post-operative complications in any case.⁹

DISCUSSION

The studies which we compared and observed in this article show that endoscopic techniques have gained a major acceptance from surgeons who slowly and surely equipped themselves with these techniques. For some other reasons and also for cosmetic oriented, patients today are more knowledgeable, and they want best options, comfortable surgical care, and best outcomes with absence of any morbidity.

It has been observed that the majority of the patients those who underwent video-assisted thyroidectomy have less post-operative pain than in the open surgery group. In addition, the length of hospital stay is comparatively shorter in the MIVAT group.¹⁰

However, it was found that there is no significant difference in post-operative complications between the both groups, and the operative time was significantly longer for the MIVAT group than the open surgery group. Patient's satisfaction of cosmetic outcome was significantly higher in the MIVAT group than that of the open surgery group.

The cervical approach utilizes small incisions in the neck thus making it cosmetically unacceptable and cannot be used for lesions >4 cm. Only patients who have small nodules with a low index of suspected malignancy are offered this endoscopic approach.¹¹ The operative field is small, and because the camera is near the anatomic structures, it often has to be removed for cleaning, which significantly increases the operating time.¹²

The axillary approach makes it difficult to visualize the opposite lobe. Although sectioning the sternohyoid muscle creates a good visual space even for the contralateral region and enables the contralateral gland of the thyroid to be resected, the operating time is extremely prolonged and the additional scar tissue causes discomfort while swallowing and neck pain as a result of adhesions. Therefore, this endoscopic procedure is not indicated for thyroid nodules that extend to the contralateral thyroid lobe.¹³

The anterior chest wall approach utilizes port access at various positions on the anterior chest wall depending on the surgeon, thus avoiding a cervical incision. In this technique, the trocars are over the sternum and infraclavicularly. These are hidden by the clothes of the patient and are not visible routinely.^{14,15}

This technique also allows bilateral neck exploration. Hence, it has been possible to perform total thyroidectomies with a central compartment clearance for papillary carcinoma and near-total thyroidectomies for large multinodular goiters. The largest dimension of thyroid lobe removed in was 11 cm. The chief contraindications to this endoscopic method are previous neck surgery and neck irradiation.¹⁵

Three-dimensional (3-D) MIVAT was carried out with a 4-mm, 3-D 0° stereoscopic endoscope. Operative time for total thyroidectomy ranged from 72 to 90 min. Neither intra-nor post-operative complications were reported during the study. The surgical team noticed a good perception of depth and easy recognizing of anatomic structures, especially concerning the upper and lower vascular pedicle, the parathyroids, the superior and inferior laryngeal nerves.¹⁰

The ideal indications for robotic surgery are still to be established. The neck area, especially the thyroid gland poses a difficult challenge for many endoscopic surgeons. Robotic surgery is useful in this area due to its excellent magnification and endowrist function. The mean operating time was 218 min. There was a steady decrease in operative time from the initial case to the 15th case. The blood loss was minimal. The recurrent laryngeal nerve and parathyroid glands were identified in great detail with ease and preserved in all cases. There were no post-operative complications in any case.⁹

CONCLUSION

MIVAT can be performed safely and effectively as open thyroidectomy and can be the treatment of choice in a selected group of patients.

Endoscopic thyroidectomy via the anterior chest wall approach combines the advantages of minimal access techniques. In spite of the reduced size of skin incision, precise anatomic details are observed through a greatly magnified view using an endoscopic camera. Large nodules have been removed, and total thyroidectomy has been done without using cutaneous elevation. Decreased pain and better cosmetic results are the greatest benefits of this procedure. It also results in decreased functional loss due to transection of the neck musculature after open surgery.

Central compartment clearance can be done effectively. Using this technique performing modified neck dissections endoscopically is possible. The technique is safe and effective in the hands of an appropriately trained surgeon.

With 3-D MIVAT preliminary impression suggests that 3-D MIVAT is safe and effective. Future studies with larger case series are required to determine the role of this procedure.

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