

Original Research Article

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Remote access endoscopic parathyroidectomy: a study of 17 cases from Central India

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ABSTRACT

Background: It has been debated that "remote access endoscopic parathyroidectomy" requires extensive dissection, thereby, increasing the risk of complications. Hence, the aim of this study is to assess the feasibility and safety of remote access endoscopic parathyroidectomy via the unilateral axilla-breast approach (ABA) and transoral vestibular approach (TOEPVA).

Method: The study includes 17 patients with primary hyperparathyroidism undergoing endoscopic parathyroidectomy from January 2016 to December 2020. Of these, 11 patients underwent parathyroidectomy via unilateral ABA and 6 had TOEPVA. Preoperatively, ultrasonography of neck, sestamibi scan and CT scan neck were done to localise the diseased gland. Post operatively, Serum calcium and parathyroid hormone levels were monitored.

Results: The mean age of patients was 35.6 ± 10.5 years. Except one, all the patients were females. The mean operative time of the unilateral ABA and TOEPVA group was 93.67 ± 28.64 minutes and 138.6 ± 31 minutes respectively. Except for three patients, in all the patients, the parathormone levels normalised. One patient had hungry bone syndrome postoperatively. The mean hospital stay of the unilateral ABA and TOEPVA group was 3 ± 1.5 days and 4 ± 3.09 days respectively. One patient had post-operative transient recurrent laryngeal nerve paresis. Seroma and surgical emphysema were seen in two patients each.

Conclusions: Remote Access Endoscopic parathyroidectomy may be considered safe in treatment of parathyroid tumours. Precise preoperative localisation is mandatory. In addition to a magnified view and a better illumination, the potential advantages of endoscopic techniques are better cosmetic results, decreased hospital stay and better patient comfort.

Keywords: Endoscopic, Parathyroidectomy, Unilateral axilla breast approach, Transoral vestibular approach

INTRODUCTION

Parathyroidectomy is the standard line of management for primary hyperparathyroidism which is characterised by symptomatic hypercalcaemia due to excessive parathyroid hormone (PTH) secretion. Historically, parathyroid surgery has undergone immense evolution. Conventional surgical practice has been collared incision with bilateral neck exploration and a four-gland

evaluation approach followed by the three and a half gland approach.¹

With the advances in the field of nuclear studies, minimally invasive techniques of unilateral exploration limited to the site of diseased gland were developed.² These include mini-incision, video-assisted parathyroidectomy and endoscopic parathyroidectomy. Focused parathyroidectomy via a mini- incision is currently the standard technique worldwide.³⁻⁵

The endoscopic approach has an advantage of magnified vision with a better illumination, thus, permitting a safe dissection.⁶ Various approaches for endoscopic parathyroidectomy have been reported in literature. The extra cervical approach has an advantage of a scarless neck.^{7,8} Although, total endoscopic techniques with extra-cervical accesses, improve cosmetic outcome, it has been debated that it requires extensive and difficult dissection to reach the operation site through extra-cervical access, increasing the risk of complications and the invasiveness of the procedure.⁹

Hence, the aim of this study is to assess the feasibility and safety of totally endoscopic remote access parathyroidectomy via the unilateral axilla-breast approach (ABA) and transoral vestibular approach (TOEPVA) in the treatment of parathyroid tumours.

METHODS

A retrospective review of the records of all the patients undergoing remote access endoscopic parathyroidectomy (via a unilateral breast- axilla approach or transoral vestibular approach) in the Department of Surgery, Government Medical College, Nagpur from January 2016 to December 2020 was done. This is an observational study. Preoperatively, all the patients underwent ultrasonography (US) and ^{99m}Tc-labelled sestamibi (MIBI) scan for localisation of the diseased gland. CT of the neck and thorax was done in select patients. No intraoperative adjuncts such as a gamma probe, IOPTH measurements or frozen sections were used. Calcium and PTH levels were checked prior to discharge and patients were followed up in the outpatient clinic, where serum calcium and/or PTH levels were checked to determine success of the procedure. The statistical analysis was done using software Epi Info 7.2.1.0.

Operative procedure for endoscopic parathyroidectomy by unilateral breast axilla approach

The patients were operated under general anaesthesia with endotracheal intubation with a flexometallic tube. The position of the patient was supine with moderately extended neck using a sandbag under shoulders and the arm on the side of lesion extended (Figure 1). The procedure was done using three ports viz; a 10 mm camera port in the anterior axillary fold midway of lateral border of pectoralis major muscle, the second 5 mm right hand working port at 12 o'clock circumareolar and the third left hand working port at anterior axillary fold in deltopectoral groove (Figure 2). The initial blunt dissection was carried out in the subcutaneous plane up to supraclavicular region followed by the creation of the working space aided by carbon dioxide insufflation. The further dissection was carried out in the subplatysmal plane. The sternocleidomastoid muscle identified, and plane between sternocleidomastoid and sternohyoid muscle was created. After elevating sternohyoid muscle, sternothyroid muscle was identified and retracted

anteriorly exposing the ipsilateral thyroid gland. The parathyroid adenoma identified posterior to the thyroid gland. If need aroused, the inferior pedicle was dissected, identifying the recurrent laryngeal nerve. Dissection was continued all around the affected parathyroid gland using the harmonic scalpel or ligature. After hemostasis was achieved, gland was retrieved through the indigenous endobag, made up of glove.



Figure 1: Patient position during endoscopic parathyroidectomy by unilateral breast axilla approach.



Figure 2: Port position during endoscopic parathyroidectomy by unilateral breast axilla approach.

Operative procedure for endoscopic parathyroidectomy by transoral vestibular approach

The patients were operated under general anaesthesia with nasal intubation with a flexometallic tube. The position of the patient was supine with moderately extended neck (Figure 3). The procedure was done using three ports (10 mm port at midline and two 5-mm ports at the lateral junction between the canine and first premolar teeth) inserted under the lower lip at the oral vestibular area (Figure 4). After saline infiltration, the initial blunt dissection was carried out in the subplatysmal plane up to suprasternal notch followed by the creation of the working space aided by carbon dioxide insufflation. The further dissection was carried out using energy source giving a wide up to down view (Figure 5). The strap

muscles were dissected and/or divided using energy source. The bipolar diathermy was used for hemostasis. The strap muscles were retracted laterally using silk sutures to reveal the lateral border of the thyroid gland. The adenoma was found on the posterior surface of the thyroid. Resection was done without breach of the parathyroid capsule and avoiding injury to the recurrent laryngeal nerve (Figure 6). Specimen retrieved from the 10 mm port after placing in an indigenous made endo bag. Ports were closed with absorbable sutures.



Figure 3: Patient position during transoral endoscopic parathyroidectomy by vestibular approach.



Figure 4: Port position during transoral endoscopic parathyroidectomy by vestibular approach.

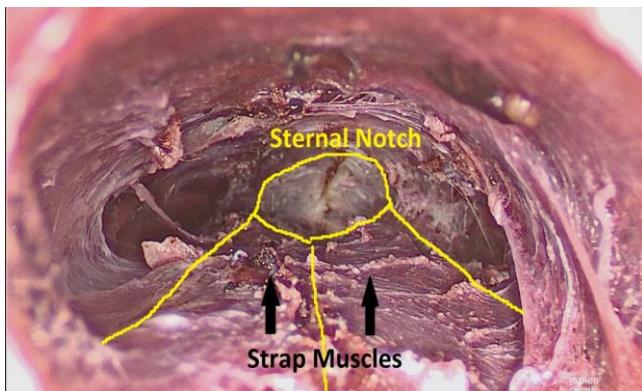


Figure 5: Endoscopic up to down view during transoral endoscopic parathyroidectomy by vestibular approach.

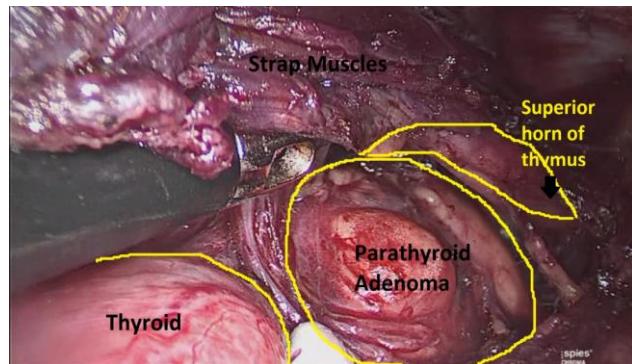


Figure 6: Endoscopic view of parathyroid adenoma during transoral endoscopic parathyroidectomy by vestibular approach.

RESULTS

The study includes 17 patients with primary hyperparathyroidism undergoing endoscopic parathyroidectomy at Government Medical College, Nagpur from January 2016 to December 2020. Out of these, 11 patients underwent unilateral axilla-breast approach and 6 underwent parathyroidectomy by a transoral vestibular approach. The mean age of patients in the study group was 35.6 ± 10.5 years. One patient was male and rest all were females. The mean operative time of the unilateral axilla breast group was 93.67 ± 28.64 minutes and TOEPVA was 138.6 ± 31 minutes. The mean diameter of the gland in the unilateral breast axilla group was 2.13 cm (range 1.4 to 3.1) and in the TOPEVA group was 2.5 cm (1.2 to 4.2 cm) (Table 1). All the patients had single diseased parathyroid adenoma. One patient had parathyroid hyperplasia.

Table 1: The demographic data of the patients included in the two groups.

Variables	Unilateral breast axilla approach (n=11)	Transoral vestibular approach (n=6)
Age (years)	33 ± 7.5	40.5 ± 13.9
Size of gland removed (cm)	2.13 (range 1.4 to 3.1)	2.5 (range 1.2 to 4.2)
Time required for procedure (min)	93.6 ± 28.6	138.6 ± 31
Hospital stays (days)	3 ± 1.5	4 ± 3.09

Two patients had a persistent elevation of the parathyroid levels post operatively. Of these, two patients one had a missed adenoma and one patient had an ectopic parathyroid. Subsequent reimaging and focussed parathyroidectomy via a neck incision cured one patient. One patient had hungry bone syndrome postoperatively. All the other patients had a successful return to normocalcaemia and normal parathormone levels. The

mean hospital stay of the unilateral axilla breast group was 3 ± 1.5 days and TOEPVA group was 4 ± 3.09 days. One patient had post-operative transient recurrent laryngeal nerve paresis following TOEPVA. Two patients had seroma and two had surgical emphysema. All managed conservatively. At follow-up, serum calcium and PTH levels were normal in all cases.

DISCUSSION

The most common cause of primary hyperparathyroidism is due to the adenoma, seen in about 80% of cases. Most commonly the adenoma involves a single parathyroid gland. In our study all patients had a single diseased gland. However, rarely multiple adenomas or hyperplasia of the parathyroid glands are also found. In up to 1% patients, the cause of hyperparathyroidism is due to a parathyroid carcinoma. Thus, the mainstay treatment of Primary hyperparathyroidism is surgical, which involves the removal of the diseased gland. When treated surgically, the cure rate approaches 95%.²

The surgical excision of the parathyroid gland was in the nascent stage until the first decade of the twentieth century.¹ Since the first parathyroidectomy in 1925 by Felix Mandl, surgeons have been working towards developing lesser invasive approaches.¹⁰ The initial approach was to remove three and a half glands for normocalcaemia. However, considering the fact that most of the patients (>85%) with primary hyperparathyroidism have a single diseased gland which is potentially identifiable and removable with selective cervical exploration, the lesser invasive approaches of parathyroidectomy were developed. With precise pre-operative localization of the diseased gland using ultrasound, thallium 201-technetium Tc 99m subtraction, and computed tomography, Pyrtek performed the unilateral neck dissection under local anaesthesia to cure of hyperparathyroidism¹¹.

The advances in preoperative localization techniques and a rapid intraoperative parathormone assay has made minimally invasive parathyroidectomy possible. Preoperative localization of the diseased gland is also crucial in reoperation for persistent or recurrent hyperparathyroidism to minimize the risk of RLN injury or permanent hypocalcemia. High resolution ultrasonography is a cheap, rapid and initial investigation for localization of the diseased gland. Its sensitivity and specificity ranges to around 70-80% and 40-100% respectively. However, the cervical adenomas <200 mg or lying behind clavicular head cannot be detected.¹²

The sensitivity of CT (with IV contrast) ranges around 60-80% in cervical adenomas. However, it reduces to only 50% in mediastinal adenomas.¹³ In cases of suspected ectopic parathyroid gland, MRI has a sensitivity of 50-88%. MRI can locate tumors >1 cm in size. However, it cannot distinguish small hyperplastic glands.

The most sensitive imaging modality for precise preoperative localization of the diseased gland is the 99m Tc-Sestamibi scan. The sensitivity ranges from 85-95%. The overall uptake in hyperplastic or adenomatous parathyroid glands depends on the blood flow, gland size, and mitochondrial activity. Tc-sestamibi accumulates both in the thyroid and the parathyroid tissue within minutes after intravenous administration. However, differential retention of the isotope in the parathyroid gland improves the localization. A MIBI scan is the imaging of choice with a positive predictive value of 86%. The studies have shown that the scan results are dependent on the size of the lesion and calcium levels.^{14,15} 99m Tc-Tetrofosmin (TETR) scan is an alternative to sestamibi. 99m Tc-tetrofosmin is retained primarily in the cytosol. The sensitivity of Tc- 99m TETR is comparable with that of 99m MIBI.

Intraoperative guidance with gamma -probe, based on in vivo radioactivity counting after injection of 99m Tc-sestamibi have also been used.¹⁶ Another adjunct for intraoperative localisation is the intraoperative quick PTH assay (QPTH).¹⁷ This assay measures intact PTH levels in the patient's plasma using an immunochemiluminometric technique and can be performed during the operation. Intact PTH has a biologic half-life of 2-3 min. A fall in QPTH level of 50% of the preoperative level at 10 min is considered indicative of successful removal. The sensitivity and specificity of this assay is 98% and 94% respectively. Due to the fact that a single adenoma is the cause in most of the cases of primary hyperparathyroidism, the overall accuracy of this assay is 97% in predicting success of surgery.

Over the last three decades, minimally-invasive parathyroidectomy has progressed. Various approaches have been tried including open approaches, radio-guided parathyroidectomy, video-assisted parathyroidectomy and purely endoscopic parathyroidectomy. In the year 1996, the total endoscopic parathyroidectomy was first described by Gagner, which employs a cervical access with use of CO₂ insufflation.¹⁸

In view of avoiding the neck scar various extra cervical approaches have been described in literature viz from the chest wall, breast and axilla.¹⁹⁻²¹ Although, the totally endoscopic techniques with extra cervical access improve the cosmetic outcome, the feasibility and safety of these techniques have been questioned.⁹ It has been debated that the totally endoscopic parathyroidectomy through an extra cervical access require extensive dissection, thereby increasing the morbidity of the procedure. However, our study clearly shows that the remote access endoscopic parathyroidectomy is feasible with minimal morbidity.

The transoral vestibular approach was first introduced by Anuwong et al for thyroidectomy.²² Since then, this approach has gained popularity as a extra cervical access for endoscopic thyroidectomy. However, the feasibility of

parathyroidectomy by the transoral vestibular approach has also been demonstrated by several groups.^{23,24}

Bhargava et al have also demonstrated that with proper case selection, the transoral TOEPVA technique is an alternative for parathyroidectomy especially for unigland sporadic primary hyoerparathyroidism.²⁵

Transient recurrent laryngeal nerve palsy was reported in one case by Karakas et al. One of our patients who developed recurrent laryngeal nerve paresis in the post-operative period recovered over a period of time.²⁶ In literature, gas related complications like hypercarbia, subcutaneous emphysema, mediastinal emphysema and cardiac arrhythmias have been mentioned.⁹ In our study, two patients had post-operative surgical emphysema which was managed conservatively. It has been found that the gas related morbidity is due to high insufflation pressures which can be prevented by maintaining low insufflation pressures of 5-6 mm Hg.²⁷

In the last decade, many surgeons around the world have gained interest in the technique of remote access endoscopic parathyroid surgery. The technique is challenging even in the hands of an experienced laparoscopic surgeon. This approach involves working in a narrow space and thus requires advanced laparoscopic skills. Hence, it cannot be overemphasised that this surgery should not be undertaken by an inexperienced surgeon. The limitation of our study is the small sample size operated by a single surgeon. Further large-scale study with a large sample size is required to validate the reproducibility of these results by surgeons with relatively lesser experience.

CONCLUSION

Remote access Endoscopic parathyroidectomy via the unilateral axilla- breast approach and transoral vestibular approach is safe and feasible. However, a precise preoperative localization of the diseased gland using radiological and/or nuclear scan is mandatory. Endoscopic technique offers a magnified view and a better illumination, permitting a safe dissection. The potential advantages of endoscopic technique are better cosmetic results, decreased hospital stay and better patient comfort. Thus, remote access endoscopic parathyroidectomy must be considered a safe surgical approach in treatment of parathyroid tumours.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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