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# Total thyroidectomy using intracapsular dissection: the technique, complications, and surgical outcomes

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## Abstract

**Background:** Diseases of the thyroid gland are common with a prevalence of 4–7% in the general population, the incidence being higher in endemic areas. Surgical removal is one of the most important treatments for thyroid swellings and it is very important for both the surgeon and patient to understand the surgery, its complications and the outcome. The most frequent complications of thyroid surgeries are related to the injury of recurrent laryngeal nerves or metabolic derangements related to injury of parathyroid glands. Hence intracapsular dissection may be carried out to avoid these potential complications which ensure a good surgical outcome in a select group of patients. The study aims to define the technique of thyroidectomy using intracapsular dissection and assess the complications related to this technique of thyroid surgery. This prospective observational study was carried out on 41 patients who underwent total thyroidectomy after evaluation from November 2013 to June 2016.

**Results:** Two patients developed transient hypocalcemia following the surgery out of 41 patients. No patients developed permanent RLN palsy or permanent hypocalcemia.

**Conclusion:** Thyroidectomy done using the intracapsular dissection technique is a safe and easy procedure for benign thyroid swellings. This technique aims to minimize tissue handling and dissection in the lateral thyroid groove and thereby reduce the postoperative complications related to the injury of recurrent laryngeal nerve and parathyroid glands, increasing the surgical outcomes and patient compliance. Hence, intracapsular dissection can be routinely practiced for the extirpation of benign thyroid swellings.

**Keywords:** Total thyroidectomy, Intracapsular dissection, Complications, Surgical outcomes

## Background

The global prevalence of thyroid diseases is estimated at more than 2 billion with more than 40 million in India [1]. The number of thyroid diseases being diagnosed is increasing due to greater awareness and availability of expertise at ease. With more people recognizing alteration or loss of voice as a complication of thyroid surgery, there is a change in trend in many countries, preferring

otorhinolaryngology (ORL) surgeons for thyroid surgeries [2]. This trend is encouraged by the ORL surgeons sub-specializing in head and neck surgeries and the surgeons are bound to give better care, reducing the morbidity associated with the procedure. Thyroid surgery in the hands of experienced surgeons is currently one of the safest procedures performed. While complications following surgical removal of the thyroid gland are rare, their consequences can often be debilitating and even life-threatening. Safer surgical techniques with better postoperative outcomes are being considered to give patients a good quality of life with very minimal morbidities. There is continuous evolution in the surgical management of thyroid diseases, from highly morbid to highly

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sophisticated surgery with minimal or even no morbidity [3]. The technique of intracapsular dissection, which reduces the injury to the parathyroid gland while protecting the recurrent nerves, is a very safe and easy procedure for benign thyroid swellings. The simple steps involved in this procedure along with minimal tissue handling of the surrounding structures help the surgeon utilize his surgical expertise to give better and complication-free outcomes to patients undergoing thyroidectomy using this technique. However, it mandates a proper case selection, and thorough knowledge of thyroid anatomy and its variations to avoid potential complications.

## Methods

This study was conducted on 41 patients undergoing total thyroidectomy using the intracapsular dissection technique at Bapuji Hospital and Chigateri District Hospital, teaching hospitals attached to the Department of ENT-Head and Neck Surgery, J.J.M Medical College, Davangere, India, during the study period of November 2013 to June 2016. All patients underwent preoperative ultrasonographic assessment and FNAC with Bethesda grading. Based on the clinical examination and correlation of investigative findings, patients with benign diseases were subjected to surgery. All the surgeries were performed by the same surgeon. If there was a suspicion for the swelling to be malignant, patients were counseled for revision surgery and the need for radioiodine scan and ablation postoperatively if necessary.

Inclusion criteria:

- a) Patients diagnosed to have thyroid swellings in a euthyroid state requiring surgical management, willing for surgery under general anesthesia.

Exclusion criteria:

- a) Patients with thyroid swellings with an already damaged RLN as diagnosed by preoperative examination
- b) Patients undergoing thyroidectomy for recurrent thyroid disease, USG, and FNA suggestive of malignant disease and need for concomitant lymph node dissection
- c) Patients with hyperparathyroidism
- d) Patients who are not fit to undergo surgery under general anesthesia

The cases that met the inclusion criteria cited above were included in the study.

- Duration of study was from November 2013 to June 2016

- Approval from the Institutional Ethical Review Board (IERB), JJM Medical College, Davangere were obtained for all cases.
- Written informed consent for participation was obtained for all cases.

## Surgical technique

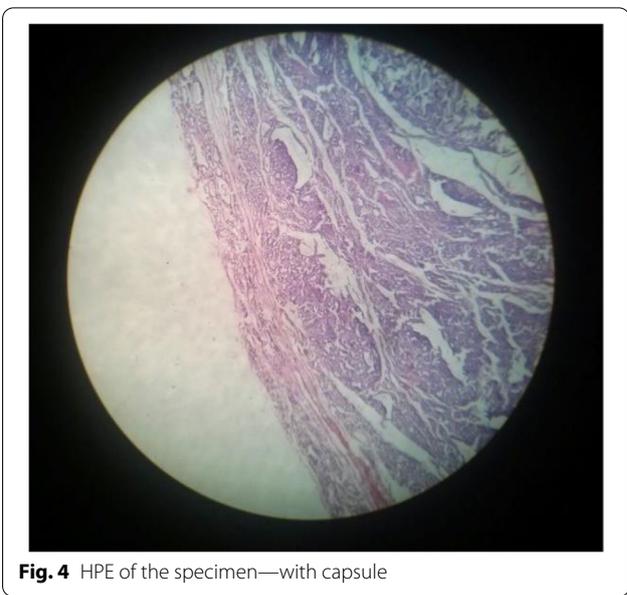
An incision is made in the natural skin crease near the cricoid cartilage between the medial borders of the sternocleidomastoid muscles. Subplatysmal flaps are raised, the strap muscles are separated in the midline, and the thyroid gland is identified. The middle thyroid vein is identified and ligated after rotating the thyroid gland medially. The superior thyroid artery branches are carefully ligated close to the superior pole taking care not to injure the external laryngeal nerve. Inferior thyroid veins are ligated at the lower pole. The gland is separated from the attachments after achieving complete hemostasis. The thyroid capsule is identified and the gland is separated from the capsule using blunt dissection after ligating the terminal branches of the inferior thyroid artery (Fig. 1). A similar procedure is carried out on the other side and the thyroid gland is completely separated from the capsule leaving behind the capsule so that the RLN and parathyroid glands are well protected from inadvertent injuries and devascularization (Fig. 2). The RLN is not sought routinely and traced only if encountered higher in the field during the dissection. The parathyroids are not routinely identified in this dissection as the glands lie just outside the capsule or in close adherence to the capsule. The intracapsular dissection technique of thyroidectomy involves a more medial dissection as compared to the conventional technique of routinely identifying and dissecting the RLN and the parathyroids in the



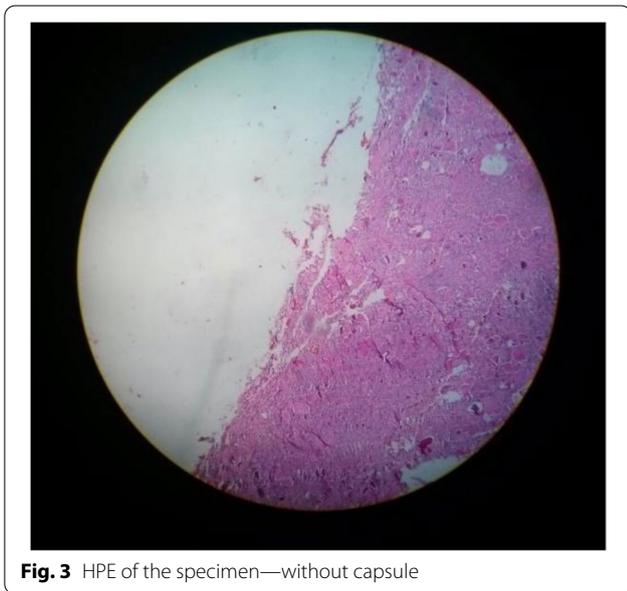
**Fig. 1** The thyroid capsule



**Fig. 2** Total thyroidectomy specimen



**Fig. 4** HPE of the specimen—with capsule



**Fig. 3** HPE of the specimen—without capsule

tracheoesophageal groove. Complete hemostasis and asepsis are maintained throughout the procedure. A suction drain is placed, the straps are closed in the midline, and the wound is closed in two layers. During extubation, vocal cords are assessed for mobility. The specimen is sent for histopathological examination and the diagnosis is confirmed. Histopathological examination confirmed the absence of capsules in our surgical specimens (Figs. 3 and 4).

**Monitoring and management**

After surgery, patients were followed up at regular intervals to look for immediate and long-term complications. Serum calcium was sent on post-op day 1 for

**Table 1** Indications for surgery

Diagnosis	No of cases	Percentage
Multinodular goitre	26	63.41
Colloid goitre	11	26.82
Solitary nodule	4	9.75

all and day 3 only if any symptoms of hypocalcemia manifested. IDL examination was done on POD1 and before discharge. After discharge, patients were followed up on day 10, 1 month, 3 months, 6 months, and 1 year postoperatively. Discharge teaching in terms of identification of complications and seeking immediate medical help were conveyed to patients. Temporary hypocalcemia was defined as a serum calcium level of less than 8.0 mg/dL in at least 2 consecutive samples. If hypocalcemia was seen beyond 6 months and required treatment, it was termed permanent.

**Results**

In this study, we have analyzed in detail our observation of various postoperative complications following total thyroidectomy done using the intracapsular dissection technique in 41 patients (Table 1). Two patients developed clinically evident transient hypocalcemia postoperatively and were treated with oral vitamin D and calcium supplementation (Table 2). None of them went on to develop permanent hypocalcemia. The mean postoperative stay following surgery was 4 days.

**Table 2** Incidence of postoperative complications

Postoperative complication	No. of cases	Incidence in percentage (n = 41)
Bleeding	0	0
Hematoma	0	0
Transient hypocalcemia	2	4.87
Transient hoarseness	0	0
RLN paralysis	0	0
SLN paralysis	0	0
Permanent hypocalcemia	0	0
Thyrotoxic storm	0	0
Airway obstruction	0	0
Seroma	0	0
Wound infection	0	0

## Discussion

Forty-one patients who underwent total thyroidectomy using the intracapsular dissection technique were studied to analyze the occurrence of postoperative complications with a special emphasis on RLN injury and hypocalcemia. This study was conducted to define the technique of intracapsular dissection in thyroidectomy, and its ease of performance with a short learning curve as compared to the conventional technique of total thyroidectomy. Only benign thyroid swellings were operated on using this technique. Total thyroidectomy is a safe straightforward anatomical procedure in which meticulous dissection can protect the parathyroid glands and the recurrent laryngeal nerve. The main controversy surrounding the surgical treatment of benign thyroid disease relates to the appropriate extent of resection [4]. Proponents of limited resection base their argument on the fact that total thyroidectomy is associated with a higher complication rate, particularly of recurrent nerve injury and hypoparathyroidism than a lesser operation. However, with appropriate surgical technique, namely capsular dissection, the complication rate of total thyroidectomy can be minimized [5, 6]. In recent literature, the reported incidence of recurrent laryngeal nerve palsy varies between 0.3 and 1.7%, whereas the rate of permanent hypoparathyroidism ranges from 0.7 to 3.0% [5, 7, 8]. Before 1983, the recurrent laryngeal nerve was routinely identified during dissection, but since that time, the nerve is protected by the technique of capsular dissection. As emphasized by Harness et al. [9], the nerve is not sought laterally early in the procedure, but as dissection proceeds to the area of the ligament of Berry, the nerve will often be “encountered” as it courses through or close to the ligament itself. In the 1970s, the standard approach to the thyroid gland

was to identify, very early in the procedure, the recurrent laryngeal nerve (RLN) as it lay in the tracheo-oesophageal groove. The nerve was then dissected throughout its entire length to the cricopharyngeus, removing all tissue medially while attempting to preserve the vascular supply of the parathyroid glands in the process. There were two major problems with this approach: first, the blood supply to the parathyroid glands is at risk with the removal of all tissue medial to the RLN, even when the vascular pedicle to each gland is identified and carefully dissected; second, extensive dissection and exposure of the RLN may place it at a greater risk of neuropraxia because of interference with the blood supply to the vasa nervorum along its length. Capsular dissection involves commencing the lateral component of the dissection high on the surface of the thyroid gland, dividing only the tertiary branches of the inferior thyroid artery and progressing posteriorly. In the process, the vascular supply of the parathyroid glands is often well preserved and minimal dissection and exposure of the RLN is the rule [10]. The introduction of capsular dissection, which reduces the injury of the parathyroid gland while protecting the recurrent nerves [11], has contributed to a decrease in surgical morbidity in comparison to rates described in the old series. Wade [12] advocated that the RLN is very vulnerable and should not be visualized and touched. The concept of routinely “encountering” the RLN and using the technique of capsular dissection has been advocated to avoid injuring the nerve. It is reported that the prevalence of RLN injury increases with the size of the diseased gland and the extent of thyroid resection. In our study, we have used the capsular dissection technique for total thyroidectomy procedures, the aim of which was to prevent possible complications. Transient hypocalcemia was seen in two patients. No other complications were noted. The incidence of symptomatic transient hypocalcemia in this study was 4.87%, compared to 7.6%, 13.4%, and 24.1%, in studies by Eleni et al., Serpell et al., and Koyuncu et al. [13–15]. The incidence of temporary RLN injury and permanent RLN palsy was 0.9% and 7.1% in the study of Sewefy et al. [16]. Muller et al. reported that the rates of complications associated with total extracapsular thyroidectomy are 0.9% for recurrent nerve palsy, 0.9% for hypocalcemia, 0.9% for wound infection, and 0.6% for secondary hemorrhage [17]. Rageh et al. made a prospective study on 50 patients who all underwent intracapsular total thyroidectomy, none of the patients 0% suffered from RLN palsy postoperative, and there were no parathyroid gland complications [18]. Dong et al. made a retrospective study on 44 patients who underwent thyroid capsular dissection and the result was that 1 patient suffered from postoperative hoarseness of voice [19].

The cornerstone of safe and effective thyroid surgery is thorough training in and understanding of thyroid anatomy and pathology [20]. With the extensive knowledge of ultrasonographic features of thyroid nodules to differentiate between benign and malignant and the utility of Bethesda classification of FNAC, it is now easy to plan the surgery and counsel the patient regarding the possible outcomes. However, in the context of the specimen turning out to be malignant on postoperative histopathologic examination, patients should be counseled for further treatment according to the ATA guidelines. The principle behind this technique is to keep the dissection more medial and protect the parathyroids and RLN from injury and thereby avoiding the potential complications. We could repeat this technique in every subsequent patient with similar outcomes and hence we recommend it as a safe and easy procedure for benign thyroid swellings. Intracapsular total thyroidectomy is a safe method in the treatment of benign thyroid disease and can be done easily in central hospitals and non-highly specialized centers [21]. The limitations of the study are the small sample size and the utility of this technique in malignancies.

## Conclusion

- Intracapsular thyroidectomy for benign thyroid swellings is a safe and easy procedure.
- The vascular supply of the parathyroid glands is very well preserved and minimal dissection is carried out.
- Dissection for routine identification RLN is avoided; instead, the nerve is encountered higher in the field which avoids any advertent injury.
- Postoperative outcome and patient compliance in terms of pain and general condition are very good. A low incidence of operative morbidity for the benign disease has been maintained throughout the study period.
- The technique can be practiced routinely provided the anatomy of the thyroid and associated structures along with the possible anatomical variations at times are understood well and step modified accordingly.
- It is a procedure that can be performed with safety, efficacy, and repeatability by surgeons in provincial centers.

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## Authors' contributions

SKR was the first assistant to the surgeon; he was involved in the compilation of data, detailed analysis, interpretation, and writing of the article. SUP is the chief operating surgeon; he was involved in the analysis of data along with suggestions and corrections in manuscript writing. All authors read and approved the final manuscript.

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## Declarations

### Ethics approval and consent to participate

Approval from the Institutional Ethical Review Board (IERB), JJM Medical College, Davangere was obtained for all cases. Written informed consent for participation was obtained for all cases.

### Consent for publication

Not applicable.

### Competing interests

The authors declare that they have no competing interests.

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