Introduction
The thyroid operation is considered by many to be at the pinnacle of endocrine surgery. The surgeon who can perform a good thyroidectomy can, with little additional training, handle most of the other operations in this field, because the technique required is much the same. Most endocrine surgeons agree that an accurately performed thyroidectomy requires both experience and technical ability. This has lead various national endocrine surgical associations to strive for the creation of centers of excellence for the future training of endocrine surgeons(1;2).

Unacceptably high incidences of major complications, like recurrent laryngeal nerve palsies and permanent hypoparathyroidism are still reported in the surgical literature. Experience, sound judgment, meticulous technique and adequate training are the hallmarks required to eliminate these (3). Notwithstanding the limited facilities, the shortage of trained staff and inefficient health planning programs in developing countries,
it is possible to make up for the shortcomings with a little more enthusiasm and dedication to achieve better results. It would be prudent to design appropriate training programs and introduce uniform guidelines and standards for performing these operations for the whole East and Central African region.

Due to our unique disadvantaged position in the medical world, there has been a tendency to copy-cat everything without consideration to our unique cultures, customs and priorities. A typical example is: the indications of surgery for a benign asymptomatic goiter in an old African lady and her counterpart in the West should not be the same in my opinion. The concept of cosmetics is rather different in both women. Lack of a health insurance system worth talking about and rampant poverty should also encourage a bit of conservatism when it comes to indications for thyroidectomy.

Controversy on the best surgical procedure for various types of goiters still rages in the West, although the tendency is toward radical techniques, even for benign lesions. There are documented advantages of total thyroidectomy for some cases of benign goiter as pointed out by Bron and others(4;5). Delbridge is a proponent for total thyroidectomy in almost all benign goiters in which surgery is indicated(6). The more conservative surgeons are mainly concerned about increased debilitating complications associated with the radical techniques. When these operations are attempted by inexperienced novices in small poorly equipped hospitals, the complication rates and gravity are not any different from what Kocher, Billroth and Mickulicz and many others experienced in the 19th century(4). And yet these recently graduated rural surgeons, who might have assisted in several thyroid operations during training, feel motivated to attempt these techniques; just because the gurus of endocrine surgery recommend it in conferences and on the internet. The results are usually catastrophic.

Recent innovations in thyroid surgery include minimal access and laparoscopic techniques as popularized by Miccoli and others(7;8). Obviously these would not be applicable to the huge endemic goiters seen in developing countries, although they have their applications for small benign nodules and parathyroid adenomas. There is also quite a debate going on as to the usefulness of these techniques in comparison to open thyroidectomies, as they actually leave significant scarring, especially the so called video-assisted minimal access. Mammary and axillary approaches have been introduced to eliminate cervical scars(8;9). Outpatient thyroidectomy and short stay procedures are now well established(10), but should be used in selected patients because of the risk of bleeding(11).

**Surgical Anatomy**
The surgeon must be familiar with the normal anatomy of the neck and the anatomical course and position of the laryngeal nerve and the location and blood supply of the parathyroid glands in order to be able to perform successful thyroid surgery. The
Tubercle of Zuckerkandl is a thickening of thyroid tissue that is located at the most posterolateral edge of the thyroid gland (Fig.1).

Its importance lies in its close proximity with the parathyroid glands and the RLN. This stresses the need for good exposure as a general principle during thyroid operations. It is a fundamental surgical principle that to avoid damaging any vital structure at operation that structure must be clearly identified by the surgeon. The recurrent laryngeal nerve (RLN) at thyroidectomy is no exception to this rule(12). Clark reported zero rates of RLN injury in a large series of total thyroidectomies for thyroid cancer using this strategy(13). The reported incidence of the RLN palsy varies from 0% to 14%. Several factors influence the likelihood of injury to the nerve, including the underlying disease, the extent of resection, and the experience of the surgeon. Bleeding should and can be kept to a minimum and the use of diathermy should be avoided in the vicinity of the
laryngeal nerves. Iatrogenic injury to one nerve may be asymptomatic, but often results in patient morbidity from hoarseness and reduced vocal range. Bilateral nerve injury results in complete voice loss, with or without major respiratory distress(14)(Fig.2). Rosato and other authors have reported on various factors that could lead to voice changes post thyroidectomy besides iatrogenic injury(14-16). This underlines the importance of both pre and post operative voice assessment, although Yeung has found indirect laryngoscopy of limited value in the preoperative assessment of symptomatic patients(17). A full assessment may not always be possible in a district hospital, but basic IL of the vocal cords is within the skills of a rural general surgeon. It is more complex to assess injuries of the superior laryngeal nerve and its branches. A non-recurrent laryngeal nerve is rare but failure to identify it could cause inadvertent injury and dire consequences.
The external laryngeal branch of the superior laryngeal nerve (ESLN) provides motor innervation to the cricothyroid muscle. This muscle is responsible for tensing the vocal cords and its injury leads to weakness of voice. It runs in close proximity to the superior thyroid artery and is therefore vulnerable when the vessels of the superior pole are ligated, even when this pole is not enlarged. The internal branch is rarely subject to injury during thyroidectomy, except when an enlarged upper pole extends above the upper border of the thyroid cartilage. This leads to choking and aspiration due to loss of sensation to the upper half of the larynx (Fig.3)
Most humans have four parathyroid glands. Supernumery glands have been reported to be between 2.5% and 22% in different studies. The exact number of individuals with fewer than four glands is difficult to determine as the missing gland could represent an unobserved rather than an absent gland\(^\text{[18]}\). The parathyroid glands lie on the posterior
surface of the thyroid gland (Fig.1). The superior gland is located commonly on the posterolateral aspect in the tracheo-esophageal groove 1-2 cm above the intersection of the RLN and the inferior thyroid artery, within an area of the same radius. Unusual locations include intrathyroid, posterior aspect of neck above the upper thyroid pole, and the retropharyngeal space.

The inferior parathyroids are very inconsistent in position, their commonest location being the posterolateral aspect of the lower pole of the thyroid gland, below the inferior thyroid artery. They are sometimes located in the superior mediastinum within the thymus.

**Surgical Strategy**

Total thyroid lobectomy (as distinct from nodulectomy or partial lobectomy) is the total extracapsular removal of one lobe and the isthmus, preserving an intact RLN, SLN and viable parathyroid glands. Total thyroidectomy (as distinct from subtotal or near total thyroidectomy) is the performance of a total thyroid lobectomy on both sides at the same sitting (19).

When the technique of total thyroid lobectomy is mastered, it is then possible to perform other procedures on the thyroid gland with ease. That is why it is the first step in the training of thyroid surgery in most centers. This technique is recommended for all unilateral nodules for the following reasons:

a. This avoids re-operating on the same side if further surgery is required, with the associated increased risk of complications and technical difficulty. Neither FNAC nor frozen section will always give the correct histopathological diagnosis (20;21).

b. Technically it could be easier than a partial resection when mastered, as there is less bleeding with better delineation of the anatomical structures.

We shall describe the technique of hemithyroidectomy in detail followed by descriptions of the other steps and modifications required for a ‘partial thyroidectomy’ and total thyroidectomy.

**Hemithyroidectomy**

A general anesthetic is generally required for thyroidectomy, although it is possible to perform the procedure under a local anesthetic. Spanknebel et al. reported 1025 consecutive thyroidectomies done under local anesthesia over a 16 year period (22). It is an extremely uncomfortable and frightening experience for the patient. Personally, I believe local anesthesia should be relegated to high risk patients in whom a general anesthetic is ‘contraindicated’ or in remote areas where an anesthetist or clinical officer is not available. Overextension of the neck should be avoided especially in the elderly. A roll or firm pillow placed transversely under the shoulders with adequate head support is essential to the proper positioning for thyroidectomy. Both arms should be placed comfortably by the sides and held with towels tucked under the patient, with additional padding at the elbows to avoid pressure on nerves. A 15-20 degree upward tilt of the head of the table improves exposure and reduces venous congestion in the neck (23;24) (Fig.4).
Access to the gland
The site of the incision is marked on the ward with the patient’s neck in the neutral position. A crease line is the best but it should not be less than 2cm or 1 finger breath from the jugular notch, especially in black patients who are prone to keloid formation below this line.25 The extent from the midline will depend on the size of the goiter and the length of the neck, but rarely more than 5cm each side for the average goiter (Fig.5). In case of large goiters we do not hesitate to extend the incision on either side.26 Ikeda et al. use a mini-incision of 3 cm.27 This is probably possible in small goiters and not the type we see in our part of the world. We frequently infiltrate about 40-60 milliliters of ‘Jungle Juice’ beneath the platysma, as it facilitates the formation of the skin flaps by reducing bleeding. This an old habit from the pre-diathermy days, which we still find useful. It consists of a mixture of 180mls normal saline, 20mls of xylocaine 2%, 1 ampoule of adrenaline 1:1000 and 1 ampoule of hylase.

Fig 5

Fig.6 illustrates the technique of raising the skin flaps. A scalpel or scissors are both effective and the choice depends on the preference of the surgeon. Personally I find the
Mayo’s scissors effective as it can be used for both sharp and blunt dissection. The flaps are raised to the thyroid notch superiorly and to the suprasternal notch inferiorly(24). It is important to stay anterior to the anterior jugular veins, under the platysma, to achieve a bloodless dissection. These skin flaps are held apart by one or two Joll’s self-retaining retractors or wishbone retractors depending on the surgeon’s preference. In our region, it usually comes down to what is available and the surgeon should be able to exercise flexibility and use the available instrument, especially in a rural setting.

![Image of surgical procedure]

**Fig. 6**

The strap muscles are separated by opening the linea alba from just below the thyroid cartilage up to the jugular notch. This is a relatively bloodless dissection as it is rare to find significant circulation across the midline and the vessels could easily be controlled with diathermy when they occur (Fig. 7).
The sternohyoid and sternothyroid muscles are sometimes divided for greater exposure of a large or vascular lobe (Fig.8). This is more frequently encountered in developing countries as the goiters tend to be large when the patients present for surgery, and are often associated with complications like airway obstruction. All the 4 strap muscles are supplied by the ansa cervicales nerve which enters the muscles from the lateral border of the sternothyroid inferiorly. It is recommended to do the transection in the upper thirds of these muscles to avoid nerve injury(23).

After the above steps, we normally start the freeing of the lobe using the lateral approach(28). This entails starting at the RLN and the inferior thyroid artery. Another approach also used by some experienced thyroid surgeons is the cranial or superior approach (19;24;28). This later approach is preferable when the goiter is large as it can be
difficult to identify the RLN and the inferior thyroid artery without first mobilizing and dividing the superior pole vessels(29). We also use the superior technique when the goiter has a significant retrosternal extension or is intrathoracic. This allows the complete devascularization of the lobe from above (including if necessary transection of the isthmus) before delivering the gland gently into the wound from the superior mediastinum. I have performed a sternotomy only once in the last 18 years for a retrosternal goiter.

The thyroid lobe is dislocated and delivered medially into the wound by inserting the index finger between the lobe and strap muscles. Except in the case of secondary thyroidectomy, it is uncommon to require sharp dissection at this stage of the operation (Fig. 9).

In patients with toxic goiter or when there is venous obstruction at the thoracic inlet, large dilated veins are often encountered on the surface of the lobe. It is absolutely essential to avoid traumatizing these vessels by rough handling. Our ‘modus operandi’ at this stage has always been working in the correct plane with gentle index finger dissection and lateral retraction of the strap muscles. Every thyroid surgeon knows the near impossibility of controlling bleeding from these vessels. ‘Harmless’ it might be, but quite a nuisance to the neat surgeon who relies on a bloodless field. Worse still, the blood trickles down into the all important operative field between the carotid sheath and the trachea, rendering the exposure of the RLN and the parathyroid glands hazardous. Care should also be taken to ligate the middle thyroid vein(s) when encountered during this maneuver (Fig.10).
The assistant then applies firm lateral retraction on the strap muscles. This action opens up the ‘de facto’ working space between the carotid sheath and the trachea (Fig.11). The use of graspers should be avoided even in non vascular glands, if malignancy is suspected, to avoid breaching the capsule of the lobe.
Exposure of the external branch of the superior laryngeal nerve and the superior thyroid vessels

With the aid of firm lateral traction by the assistant with the surgeon applying a gentle medial and upward pull on the dislocated lobe, the operative field between the carotid sheath and the thyroid gland can be opened up with careful blunt and sharp dissection. As soon as the inferior thyroid artery is identified, it is followed medially to its intersection with the recurrent laryngeal nerve, if already visualized in the tracheo-esophageal groove. Looping the trunk of the artery at this stage facilitates the dissection and improves the exposure of the recurrent laryngeal nerve. This suture should be removed when the dissection has been completed.

The next step is to fully mobilize the lobe by ligation of the superior pole vessels. Here care should be taken to preserve the external branch of the superior laryngeal nerve. The upper pole is exposed by gentle downward traction on the lobe and blunt dissection laterally to break down fibrous adhesions. The ESLN is usually identified on the surface of the inferior pharyngeal constrictor before it enters the cricothyroid muscle (Fig.12).

![External branch of superior laryngeal nerve](image)

**Fig.12**

This is achieved by opening the space medial to the superior thyroid artery with an artery forceps or a pledget. Due to anatomical variations and frequent intramuscular locations (10%), it is only visualized on the constrictor in about 70% of cases. Mass ligation of the upper pole vessels should be avoided as the nerve passes between the branches of the vessels in about 20% of cases(24). These vessels are divided individually close to the gland with absorbable sutures to avoid injury to the ESLN. I do not hesitate to do mass ligation of the pole if the nerve has already been visualized. Nerve stimulation is frequently used in many centers and aids in the identification of these nerves with reduced frequency of iatrogenic damage (30;31). Friedman et al. believe a proper understanding of the 3 common positions of the ESLN mentioned above is the best way
to improve their identification at surgery (32). These injuries are usually over looked as they are difficult to diagnose at laryngoscopy. The initial symptoms are often minimal and regarded as ‘normal post-thyroidectomy voice changes’. The weakening of the voice is especially troublesome to professional speakers and singers, not to mention mothers of small children.

**Identifying the recurrent laryngeal nerve and the parathyroids**

It is now generally accepted that the branches of the inferior thyroid artery should be controlled high up on the capsule of the gland to avoid devascularising the parathyroid glands (Fig. 13). This is the technique of capsular dissection which has been popularized by Delbridge and co-authors and adapted in most endocrine centers (6). The standard technique used in the 1970s was to identify the recurrent laryngeal nerve early in the procedure as it lay in the tracheo-esophageal groove. It was then dissected up to the cricopharyngeus removing all the tissues medially while attempting to preserve the blood supply of the parathyroids. Vascular compromise is very likely when the medial blood supply is interrupted, even when their pedicles are identified and protected. Secondly, the excessive dissection of the RLN resulted in neuropraxia of the nerve due to interference with its neuronal blood supply. This technique is no longer recommended.

Dolapci et al. reported that they did not encounter any significant increase in the incidence of hypocalcaemia when they performed truncal ligation of the ITA during bilateral subtotal thyroidectomies in a prospective study (33). However, considering the morbidity of permanent hypoparathyroidism (34), it is strongly recommended not to jeopardize the blood supply of the parathyroid glands, even during lobectomies. It would be a near disaster for poor African patients with no medical insurance and living on less than 2 dollars a day to have to purchase calcium and vitamin D tablets for the rest of their lives. We now only do truncal ligation of the inferior thyroid artery in case of technical
difficulties and limit it to one side only, as much as possible.
The actual location and identification of the parathyroids and the RLN has already been referred to in the discussion on surgical anatomy in this review. With the technique of capsular dissection, it is possible to push the parathyroids gently downwards while dissecting the lobe off the surface of the trachea. This minimal handling of the parathyroids reduces the chances of interfering with their blood supply. It has also become common to auto transplant the parathyroids (PT) during thyroidectomy to reduce the incidence of permanent hypoparathyroidism. Clear indications for PT are inadvertent devascularization or devascularization during surgery. The sternomastoid muscle and forearm muscles are the common sites for PT. The lower parathyroids are frequently located ectopically in the thymus, so it is not always possible to identify all parathyroids in all patients.

The RLN is ‘encountered’ usually near the ligament of Berry, rather than being dissected along its entire length. The critical point is superiorly, where the nerve enters the ligament of Berry and could be easily injured while handling the organ of Zuckerkandl. From here medial dissection between the gland and the trachea is continued. It is mandatory to avoid any form of electro-cautery in the vicinity of the RLN as it could be damaged by conducted heat. Troublesome bleeders could be controlled with fine absorbable transfixion sutures. This dissection is continued medially until the isthmus is completely freed and the transection made close to the opposite lobe.

The stump is closed continuously with an absorbable suture in a hemostatic manner at the same time avoiding bunching up the tissues. During this dissection, the pyramidal lobe has to be completely excised. It is usually attached to the left lobe and could be traced as high as the hyoid cartilage. Its dissection could put the external branch of the superior laryngeal nerve in danger if done carelessly.
Nerve stimulation during surgery has been shown to help in the identification and protection of nerves, and consequently reducing the incidence of iatrogenic injury (36). Randolph and group recommend laryngeal palpation in combination with nerve to stimulation to further lower the incidence of RLN injuries(37), while Hillermann has come up with a rather novel but complicated technique with similar intentions. This entails securing the airway with a micro laryngeal tube and inserting a laryngeal mask airway through which a fibreoptic scope is introduced to monitor the larynx during nerve stimulation at thyroidectomy(38). Friedman has described the need for a thorough understanding of the three anatomical positions of the ESLN to avoid injury during surgery(32).

Loops are used by some thyroid surgeons to help identify the nerves. However it is generally accepted that these nerves are large enough for adequate naked eye visualization. Our unique situation in the third world does not permit these luxuries to fit into our limited budgets and we have to make do with plain surgical skill and prayers. The only consolation is that these gadgets are not a substitute for experience, meticulous technique and expertise(3).

**Total thyroidectomy**
This is in reality two hemithyroidectomies. Its indications for benign disease are still controversial(4), and are not covered in detail in this review. Complication rates in experienced hands are comparable to less extensive operations on the gland(6;39). This has been used by its proponents to recommend its universal adoption. It should be approached with caution in developing countries for reasons mentioned above. Every thyroid surgeon should be able to perform a safe, complete lobectomy. A safe and complete bilateral hemithyroidectomy or total thyroidectomy, should also be within his or her ability(40).

**Partial Thyroidectomy**
This procedure is the commonest thyroid procedure done in regions of endemic goiter. There has been a tendency in the last two decades or so to perform total thyroidectomies for endemic goitre, mainly in regions around the Mediterranean(5) and Australia. As mentioned in the first thyroid review (thyroid 1), we do not differentiate between subtotal
and partial thyroidectomy for benign non-toxic bilateral multinodular goiters. The aim is to strive to remove all macroscopically affected thyroid tissue and leave the grossly normal tissue. With this approach, it becomes purely academic to talk of partial, subtotal and near-total thyroidectomy as the residual tissue will be determined by the findings. We try to be as conservative as possible for the reasons mentioned earlier in this review.

Our main indications for surgery in these patients are for pressure symptoms. Sudden onset of difficulty in breathing is seen when a bleed occurs into a cyst causing enlargement of the goiter and tracheal compression. Pressure symptoms are commonly gradual, with the patient developing breathing difficulties in certain positions of the head. Hoarseness and severe stridor are not common presentations in simple multinodular goiters in endemic regions even in massive goiters; and usually indicate malignant change, notably anaplastic carcinoma. The retrosternal goiter is an exception as pressure symptoms occur quite early and frequently. Dysphagia is mainly seen in this group of patients. It is not unusual to encounter patients on treatment for asthma because of undiagnosed retrosternal goiter. The stridor is unfortunately mistaken for a wheeze by a busy GP. Another indication for partial thyroidectomy is cosmetic in city dwellers and young patients. It is rare for the older patients in rural areas to seek surgical intervention for cosmetic reasons. Almost everybody in endemic regions, especially in the countryside, has a close relative or a friend who has had a goiter for as long as they could remember.

Technique
The approach for thyroid resection or partial thyroidectomy is similar to hemithyroidectomy or lobectomy as described above(28). After securing the middle thyroid vein(s), upper pole of the gland and the inferior thyroid veins and delivering the lobe medially; the main difference from the lateral approach is that we identify the tertiary branches of the inferior thyroid artery on the capsule of the gland and apply a row of mosquito forceps. The isthmus is then transected to expose the trachea. This could be a difficult task in large goiters. Early excision of the pyramidal lobe superiorly and exposing the trachea inferiorly usually allows the insertion of a long curved artery forceps between the isthmus and the trachea allowing the introduction of further forceps and transection-ligation of the isthmus. The later is dissected off the trachea towards the mobilized lobe. A further row of mosquito forceps is inserted medially onto the capsule, targeting the visible blood vessels.

The resection is started by incising the capsule just above the forceps. The aim is to remove all grossly affected thyroid tissue within the capsule of the gland, working strictly within the capsule whenever possible. Bleeders are controlled by applying further mosquito forceps and later transfixed with fine absorbable sutures. Finally the edges of the capsule are stitched in a continuous fashion with a 3-0 absorbable suture, enclosing the residual ‘normal’ thyroid tissue. This technique controls the vessels on the capsule and precludes the need to tie them individually. The same steps are then repeated on the opposite side. When operating on patients with thyrotoxicosis, we use the same technique but endeavor to leave about 4gm of thyroid tissue on each side (Subtotal). The residual tissue for Plummer’s disease (Toxic nodular goiter) is usually 5-10 gm on each side.
Alimoglu et al. compared the complication rates in 3 groups of patients with toxic nodular goiters who had total, near-total and partial thyroidectomies done in one unit as a prospective study. They found no significant difference in the complications rate. The type of surgery for this condition remains one of the many controversies in thyroid surgery. The same principles of surgical exposure apply for partial resection as for doing a hemithyroidectomy. Particular care is required to protect the external branch of the SLN, the RLN and the parathyroids.

**Wound Closure**

Meticulous control of bleeders should be standard practice as the use of drains is not a replacement for hemostasis. Hurtado-Lopez et al. found that patients in whom drains were used stayed longer in hospital. Drains are not useful if severe postoperative bleeding occurs, but could reduce a small hematoma. Although used widely, active suction could damage the RLN and may not actually increase the evacuation capacity. Improvised suction drains using a 20 cc syringe and intravenous giving set tubing (perforated using a scissors) is very effective active suction. It requires closer monitoring because of the small capacity and frequent emptying may be necessary, if proper hemostasis had not been achieved. If the strap muscles had been transected to improve access to the lobe, they should be re-approximated with interrupted absorbable mattress sutures 2-0 chromic or PG. The midline incision and the platysma closure could be achieved by interrupted or continuous absorbable sutures as per the surgeon’s preference.

Skin closure can be achieved with subcutaneous stitch, clips or steristrips. We use a 3/0 or 2/0 nylon subcuticular stitch with anchoring knots at both ends, which is removed after about 7 days in the clinic. Care should be taken to allow free sliding at the time of surgery to avoid difficulties of removal and possible breakage. This is more likely to
happen with a 3/0 stitch. It is cheap, cosmetic and provokes insignificant skin reactions. Staples are ideal as they could be removed by the 3rd post-op day but tend to be more expensive. We use absorbable subcuticular stitches selectively because of the genetic predisposition of the majority of our population to keloid formation. It is usual to get impatient and recommend revision of scar or injection of steroids into most hypertrophic scars seen among dark skinned people. This should be avoided as they mature eventually in 2-3 years with gradual thinning and flattening of the scar(43).

Peri-operative Care and Complications
Small hematomas or serous collections under the skin flaps are not unusual during the first week. These resolve spontaneously. Large bleeds requiring reopening and evacuation of haematoma to relieve pressure symptoms could be avoided with meticulous technique. Large subcutaneous hematomas which are unsightly could be aspirated when they liquefy in about 1-2 weeks’ time. Care should be taken to avoid introducing infection during the needle insertion. Stridor arising from laryngeal edema due to blockage of venous return by a deep hematoma is best managed by opening the wound urgently. This may need to be performed at the bed side. If bilateral recurrent laryngeal nerve injury occurs and both vocal cords are fixed in the adducted position, severe airway obstruction, requiring a tracheostomy, results. Occasionally leaving the endotracheal tube in for 48 hours improves the breathing but unfortunately not the aphonia. A tracheostomy is usually a last resort. Large doses of hydrocortisone are usually given at this stage in an effort to reduce the effects of a neuropraxia and the edema of the injured nerve. Permanent RLN palsy after partial thyroidectomy is reported in the literature to be 0-1.3%(44).

We discharge our patients who have no major complications from the hospital within 3 days, irrespective of the type of thyroidectomy. We do not perform pre-discharge serum calcium in our patients if they are clinically asymptomatic postoperatively or if they underwent a lobectomy.
Any muscle pains, paresthesia, twitching or cramps before discharge indicate hypoparathyroidism and the patients are usually managed accordingly. 10 mls intravenous calcium gluconate 8 hourly is commenced at the same time with oral calcium and Alpha D3. It is usually possible to discharge the patient on oral medications only after 2-3 days, when the calcium levels have normalized.

The infamous thyroid storm after surgery for toxic goiters is rare among our patients. We render them all euthyroid pre-operatively, including the use of small doses of dexamethasone for about five days pre-operatively in brittle patients. This never fails to render patients euthyroid in combination with neomercazole (Carbimazole). The maximum dose of Carbimazole is 60 mg per day in divided doses, preferably. This is reduced gradually as the toxicity is controlled as evidenced by both clinical findings and biochemical analysis. If the common complications of skin rash and hematomological disturbances occur, propylthiouracil is an alternative, albeit more expensive, treatment modality. B-blockage is useful in the early stages of controlling the toxic symptoms. Propranolol is our drug of choice in initial doses of 40 mg tid. This rapidly reduces the pulse rate to below 100 per minute. We rarely use it after the second week of control. Carbimazole is continued until the evening before surgery. It is also possible to stop it a
week before surgery and control the cardiovascular symptoms with B-blockage. This has not been our practice although it is reported to lead to lesser bleeding at the time of surgery. Achieving the best possible control of toxicity is more important than worrying about some minor harmless and controllable oozing at surgery.

The need for investigations and the type of tests required during the postoperative visits are usually determined by the clinical condition of the patient. The type and extent of the surgery, would determine the need and urgency of certain investigations. Other factors which should come into consideration during the postoperative follow-up in developing countries include availability of the investigative facilities, affordability, and social status of the patient. It is rarely possible or feasible to perform an exhaustive check-list of postoperative investigations as we see in developed countries, except in major urban centers. We perform FT4 and TSH levels on all patients after partial thyroid resections after 3 months. Any compensated or overt hypothyroidism is treated with thyroxine accordingly. The optimal dose after total or near total thyroidectomy is largely influenced by body weight\(^\text{(45)}\). We do not recommend thyroxine postoperatively in patients who underwent partial resections if these hormones are within normal limits.

Clinical or symptomatic recurrences are not common, after follow-up of 12-15 years, in patients who had adequate resections for benign non-toxic multinodular goiters in our practice. These patients respond well to small doses of thyroxine and rarely require secondary thyroidectomy for pressure symptoms. Recurrences after subtotal thyroidectomy for Graves’ Disease led to the current wide use of total thyroidectomy to treat this condition\(^\text{(46)}\). The current trend is to consult with the patient as to whether they would rather undergo total thyroidectomy with no risk of recurrence or a lesser procedure which could lead to a recurrence of up to 20\%\(^\text{(46)}\). The need to take thyroxine for life seems to be of little significance in western societies.

Thyroid cancer developing in a pre-existing multinodular goiter is rare in our region. These are usually anaplastic in elderly patients with long standing goiters. I have yet to see a cancer developing in a recurrent nodular goiter after surgery. Seiler and others have noted an increased incidence of thyroid cancer in their patients with recurrences after partial thyroidectomy in an endemic goiter region\(^\text{(47)}\). This is often quoted in the literature as one of the reasons for recommending total thyroidectomy in patients with multinodular goiters. We probably need to carry out local controlled studies to justify this radical procedure on our patients. After all, there are regional disease patterns and we need our own data to provide evidence based practice.

Summary
Thyroid Surgery requires experience and sound knowledge of the regional anatomy. The ability to locate the parathyroid glands, recurrent and external branch of the superior laryngeal nerves as well as familiarity with their anatomical variations is mandatory. Complication rates higher than 5\% suggest that the surgeon does not have sufficient training or interest in thyroid surgery. Further training or referral of patients elsewhere is advisable\(^\text{(40)}\). The currently overall acceptable complication rates internationally are between 1\% and 2\%.
It would not be fair to compare the results of a top surgical unit in Sweden to a district hospital in Kenya or Malawi; but it is possible to narrow the gap by ensuring good and adequate training, backed by a genuine interest in the subject. The collar incision should be well positioned and preferably marked in the neutral neck position to achieve optimum cosmetic results. Expose the gland adequately and identify the anatomical structures clearly, while keeping bleeding to a minimum. Avoid any form of diathermy close to the laryngeal nerves. Capsular dissection of the gland and avoidance of ligating the trunk of the inferior thyroid artery is the internationally accepted approach to minimize complications without compromising the quality of surgery. The external branch of the SLN or the ‘neglected’ nerve requires extra effort to identify and should be preserved or avoided by ligating the superior pole vessels separately and away from the larynx. Drains are not a substitute to a good thyroidectomy and their use should be minimized. It is usually possible to improvise cheap drains using intravenous fluid giving sets.

**Recommendations**

- Designing appropriate training programs in the region with the aim of producing competent surgeons who are able to perform thyroid surgery with minimal supervision and few complications.
- Establishing uniform protocols for accurate reporting of results.
- Uniform guidelines and standards for performing these operations using the facilities and expertise available in the region should be formulated and promoted by the regional and national surgical bodies. ASEA and COSECSA have already taken general steps in this direction.
- The indications and extent of surgery for benign thyroid disease in the third world should not necessarily be the same with the developed countries, considering our unique environments, cultures and concepts of disease processes.
- The recommendations given for ‘Goiter 1- Endemic Goiter’ in the May review of SIA also apply for this review.

Acknowledgement

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