Minimally Invasive Thyroid and Parathyroid Surgery

Dr. Brian HH LANG

MBBS (Hons), MS (HK), MRCs (Edin), FRACS, FCShK, FHKAM (Surgery)
Associate Consultant & Division Chief of Endocrine Surgery, Queen Mary Hospital, the University of Hong Kong Medical Centre, Hong Kong

Introduction

Since the 1980s, minimally invasive surgical techniques have attracted immense interest in all surgical specialties, including abdominal, thoracic and most recently head and neck surgery. This article aims at reviewing the emergence of minimally invasive thyroidectomy (MIT) and parathyroidectomy (MIP) and their applications to benign thyroid and parathyroid diseases respectively. For the purpose of this review, MIT and MIP will be considered separately as they deal with different pathologies.

MIT

The conventional thyroidectomy by making a skin crease incision in the anterior neck just over the thyroid gland has been the most efficacious way of treating a variety of thyroid pathologies as it provides good direct surgical access to facilitate safe dissection and is associated with low morbidity in experienced hands. However, some patients are still left with a relatively long scar in the neck. Furthermore, the majority of patients are women and they are understandably concerned about the aesthetic appearance of the scar. As a result, there has been an immense interest among thyroid surgeons to make smaller neck incisions or even to make “invisible” incisions (i.e. incisions outside the neck such that they are covered by clothing). The concept of MIT really gained momentum in 1996 when Gagner et al. performed a totally endoscopic subtotal parathyroidectomy for a 37 year old man suffering from familial hyperparathyroidism.1 Although the operation took over 5 hours, it was a success. Since then, a variety of MIT techniques has been described. They can be grouped into two broad approaches with each having their own advantages and disadvantages and they are:

The Cervical / Direct Approaches

These involve placing small, almost stab-like incisions in the anterior neck. The operating space is usually created by blunt dissection and maintained either with low pressure (6-8mmHg) CO₂ insufflation or by external skin retraction. Conventional laparoscopic instruments are often used. These approaches come in different forms and under different names. They include anterior cervical approach, lateral cervical approach (Picture 1) and video-assisted approach (Picture 2). The main advantages are the direct access to the gland and shorter neck incisions (usually < 1.5 to 2cm). To date, all published series reported less postoperative pain, better cosmesis and shorter hospital stay.2,3 However, since incisions are made in the neck, for some, they remain “visible” and are prone to hypertrophy / keloid. Furthermore, some surgeons would argue that given the strict selection criteria used such as nodule size ≤ 3cm in diameter or thyroid volume ≤ 30ml, an open approach using a similar length incision is also possible.4 This partly led some to pursue the extracervical / indirect approaches.

The Extracervical / Indirect Approaches

These involve placing incisions outside the neck. Depending on preference and experience, some prefer making them in the axilla or chest while others prefer both. Nonetheless, extensive dissection under the skin
and subcutaneous layer is inevitable because incisions are made away from the thyroid gland. As a result, some authors reported prolonged paresthesia under the flap and muscle stiffness. As a result, some authors reported prolonged paresthesia under the flap and muscle stiffness. In terms of the technique, similar to the cervical approaches, the operating space is maintained either by CO₂ insufflation (Picture 3) or external retraction by specially designed skin retractors (Picture 4). Undoubtedly, the operation is technically more demanding because of the limited operating space and is therefore associated with a significant learning curve. However, having said so, several large series have been reported in various Asian countries with favourable outcomes. This approach has yet to become standard, particularly in the West. The main controversy lies in the fact that these procedures involve extensive dissection (and therefore, the name "MIT" might be inappropriate) and are often performed for "softer" indications. Nevertheless, the procedure is technically feasible and will no doubt have a promising role in the future as some patients will continue to demand a scarless (in the neck) procedure.

**MIP**

In comparison to MIT, MIP has been better accepted and less controversial. It is the treatment of choice for patients diagnosed with primary hyperparathyroidism or pHPT due to solitary parathyroid adenoma. Again, they come in a variety of forms including total endoscopic approach, video-assisted approach, radioguided approach and mini-incision approach (Picture 5) but in principle, they are similar as they all involve operating through a small neck incision and excising one single abnormal parathyroid gland without exposing the other 3 parathyroid glands. This is made possible because over 80-90% of patients with pHPT suffer from a solitary parathyroid adenoma and therefore by removing it, they are potentially cured of their disease. MIP is an operation associated with low morbidity and with a high success rate (>95%) so long as the operating surgeon is meticulous, familiar with the anatomy and experienced. However, unlike the traditional open method where all 4 parathyroid glands are explored, MIP must have accurate preoperative localisation of the abnormal parathyroid gland before it can be attempted. This is because in MIP, the operating surgeon would not have the benefit of examining the other 3 parathyroid glands and therefore, there is a possibility of missing underlying multiglandular disease such as double adenomas or 4-gland hyperplasia. In our experience, over 70% with newly diagnosed pHPT will be eligible for MIP because of a positive preoperative localisation by Tc99m sestamibi and /or ultrasound (Picture 6). To further improve the surgical success of MIP and to minimise the possibility of persistent or recurrent HPT after MIP, some have advocated the use of a variety of surgical adjuncts such as radioguided probe, quick intraoperative parathyroid hormone assay at the time of operation but to date, their routine use remains questionable because of the marginal benefit and the high "cost to benefit" ratio. Nevertheless, MIP with or without the use of adjuncts when performed in experienced hands has an equivalent success rate of greater than 95% as the conventional 4-gland exploration and has all the benefits one expects from minimally invasive surgery.

**Conclusions**

Increasing variety of MIT techniques have been reported in the literature. Both standard open thyroidectomy and MIT will continue to complement each other in the future but the question of whether MIT will become the standard approach in the future remains to be seen. On the other hand, various MIP techniques have become accepted as a standard procedure for pHPT caused by a localised solitary parathyroid adenoma.
References

9. Henry JF. Minimally invasive thyroid and parathyroid surgery is not a question of length of the incision. Langenbecks Arch Surg 2008; 393:621-6