3 Principles and Philosophy of Minimally Invasive and Remote Access Endocrine Surgery

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Minimally Invasive Thyroid and Parathyroid Surgery

Laparoscopically trained endocrine surgeons at the University of Pisa described in 1998 a technique of endoscopic-assisted thyroid surgery in which a very small incision in the cervical neck is made, and a gasless retractor-based video-assisted thyroidectomy is performed. Paolo Miccoli and his colleagues introduced a number of novel procedural concepts with their technique (Fig. 3.1). One of the first, and among the most important, is avoidance of the raising of subplatysmal flaps. This minimizes both the time required for surgery and the dissection-associated trauma to the tissues which predisposes to seroma formation and skin flap edema. Blunt dissection is used heavily and undertaken with elevators rather than sponges or peanuts. The technique eventually relied substantially on ultrasonic technology which affords the ability to ligate vessels reliably in a small space. Retraction on the thyroid gland itself is not intuitive but paramount to the successful performance of the procedure. Nerve dissection is accomplished by the use of the same blunt elevators, in a direction perpendicular to the course of the nerve. A final nonintuitive step is the placement of clamps on the superior pole in order to deliver the dissected gland through the incision. No drains are necessary, and in the Italian health system, the patients are kept in the hospital overnight.

Substantial modifications to the Miccoli technique were described by our group in an effort to facilitate its performance by lower-volume surgeons. The very first difference is that the location of the incision is identified with the patient sitting upright in the holding area in order to be certain the incision is in the proper location for when the patient is upright and in public. Some of the technical changes included the utilization of nerve monitoring as an additional safety measure, implementation of a slave monitor to improve the ergonomics especially for the camera assistant, and bundle ligation of the superior pedicle (Fig. 3.2) which reduces the time required to mobilize the superior pole. Patients are uniformly managed without a drain and on an outpatient basis. For those undergoing total thyroid surgery, routine calcium supplementation is provided to obviate the need for blood tests and to minimize the likelihood of symptomatic hypocalcemia.

An intermediate approach to minimally invasive surgery was also described in which a small incision is used but without the need for endoscopic assistance. The incision size for these

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procedures is generally between 25 and 40 mm, and the patients benefit from all of the same procedural innovations, although with a slightly longer incision.

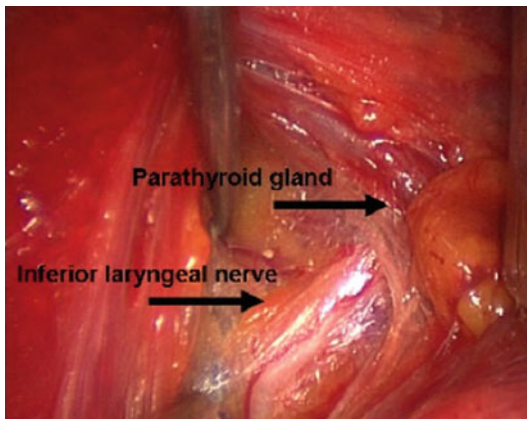

Fig. 3.1 Paolo Miccoli and his colleagues in Pisa developed a minimally invasive cervical approach that relies on endoscopic assistance to achieve and incision as small as ¾ in., with excellent visualization of the critical structures, such as the recurrent laryngeal nerve and parathyroid glands, as shown. Importantly, their innovations helped to demonstrate that the conventional approaches (and incision sizes) were no longer necessary for many patients (Reprinted with permission from Miccoli P, Berti P, Ambrosini CE. Perspectives and lessons learned after a decade of minimally invasive video-assisted thyroidectomy. ORL J Otorhinolaryngol Relat Spec. 2008;70(5):282–6)

Remote Access and Robotic Thyroid and Parathyroid Surgery

In the inexorable movement toward smaller and more easily hidden scars, and especially in cultures where a neck scar is particularly undesirable (including a number of Asian countries), Yoshifumi Ikeda from Japan made substantial contributions by innovating and refining a totally endoscopic insufflation-based axillary thyroidectomy. Although this technique is lengthy and challenging for even very skilled laparoscopic and endocrine surgeons, it paved the way for future creative surgeons who modified this approach in a number of different ways and with a number of different portals.

By 2013, the most popular technique that has emerged has been a gasless axillary approach which was refined by several different South Korean groups. Deserving of much credit in advancing this field, Woong Youn Chung merged robotic technology with remote access principles (Fig. 3.3) and was able to substantially shorten the duration of axillary thyroidectomy. This group has quickly accumulated a vast experience with this approach and proven its safety and completeness, at least in a South Korean population. A more extensive bilateral axillary and breast approach has

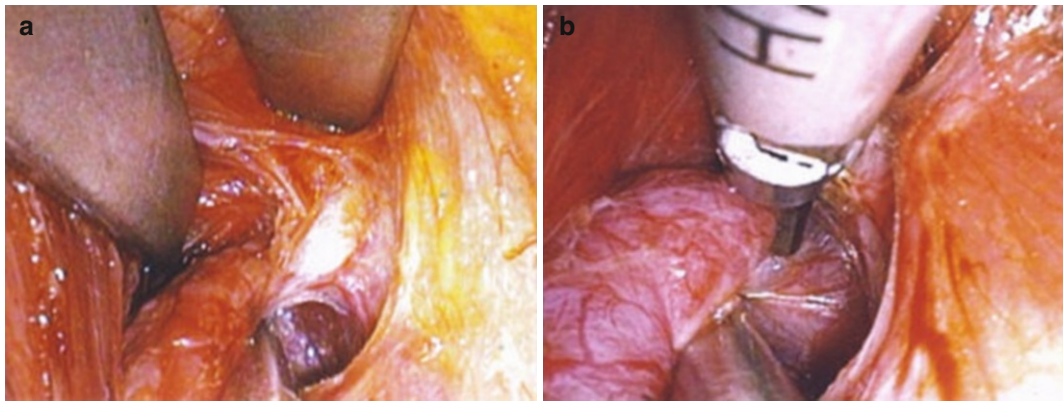

Fig. 3.2 An important modification of the Miccoli minimally invasive thyroidectomy was the application of bundle ligation of the superior vascular pedicle, which is faster and easier in the confined space of the upper pole of the thyroid gland. After the upper pole is fully mobilized (**a**), and advanced energy device is used to ligate the entire upper pedicle (**b**) in a single bundle (Reprinted with permission from Terris DJ, Seybt MW. Modifications of Miccoli minimally invasive thyroidectomy for the low-volume surgeon. Am J Otolaryngol. 2011;32(5):392–7)

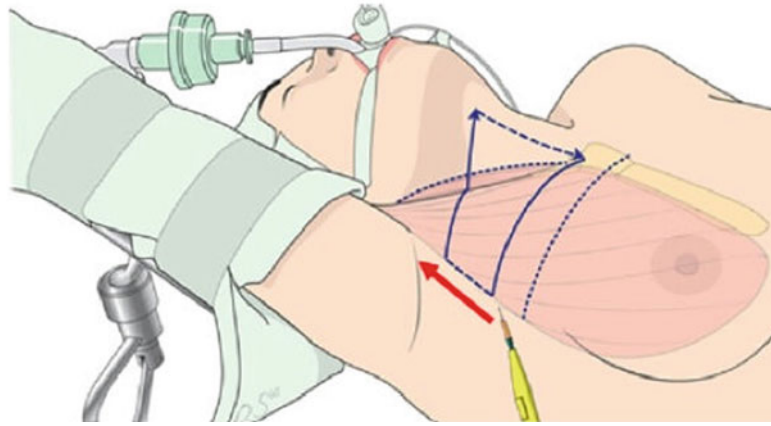

Fig. 3.3 Particularly in many Asian countries where the skin type predisposes to hypertrophic scarring and there is a cultural aversion to neck scars, remote access surgery has been extraordinarily popular. Woong Youn Chung made substantial contributions by innovating a gasless transaxillary approach that is retractor based and eventually incorporated the use of the robot (Reprinted with permission from Kang SW, Jeong JJ, Yun JS, Sung TY, Lee SC, Lee YS, Nam KH, Chang HS, Chung WY, Park CS. Robot-assisted endoscopic surgery for thyroid cancer: experience with the first 100 patients. Surg Endosc. 2009;23(11):2399–406)

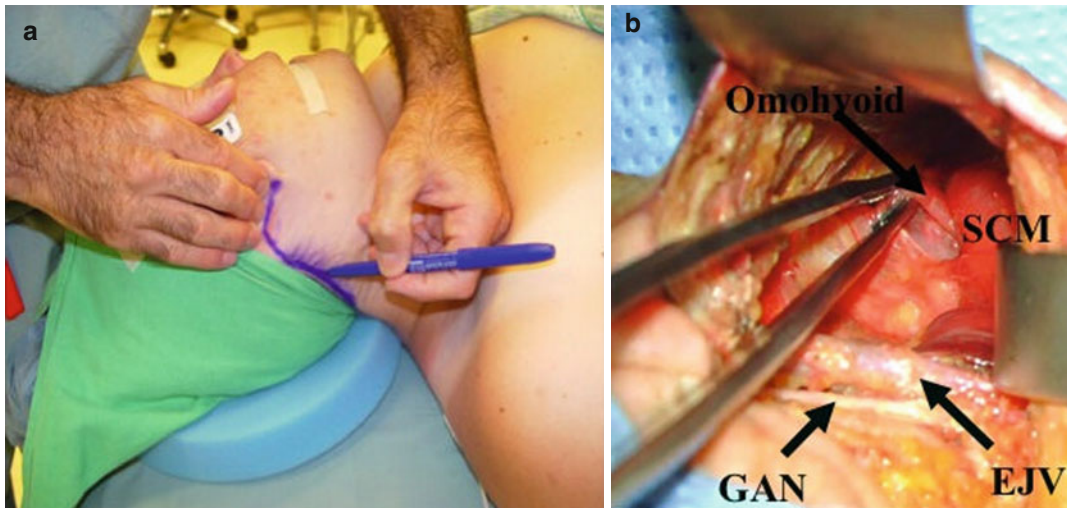

Fig. 3.4 Profound differences in patient populations hampered the extrapolation of the axillary thyroidectomy to North American patients. An alternative procedure using a facelift incision (**a**) was therefore described that is associated with easier positioning and a shorter distance to the thyroid gland. The exposure of the thyroid gland is achieved by reflecting the omohyoid muscle ventrally (**b**). *GAN* greater auricular nerve, *EJV* external jugular vein, *SCM* sternocleidomastoid muscle (Reprinted with permission from Terris DJ, Singer MC, Seybt MW. Robotic facelift thyroidectomy: II. Clinical feasibility and safety. Laryngoscope. 2011;121(8):1636–41)

also proven to be popular in the South Korean patient environment. Because of challenges in extrapolating these approaches to a North American population, an alternative approach that uses a facelift incision has recently been described (Fig. 3.4).

Future Considerations

Probably the only certain prediction that can be made with regard to the future of endocrine neck surgery is that it is bound to change. Technology continues to improve, surgical techniques continue

to evolve, and the expectations of society continue to motivate innovation and enhancements. Perhaps the thyroid will be removed through small puncture holes. Perhaps a transcutaneous noninvasive technique that is safe and effective will be described. Perhaps the need for thyroid surgery will be eliminated altogether. Regardless of the directions, the future is certainly exciting.

Recommended Reading

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