Notes on Laryngeal Surgical Technique 14

Core Messages

- This chapter concludes the in-depth study of the larynx and of oncological laryngology in the second edition of the *Practical Guide to Neck Dissection*.
- It represents the application in the surgical field of all that has been learned from anatomical studies and of the knowledge of the preferential routes for the spread of laryngeal neoplasia.
- Only the principal surgical operations are illustrated here, with no claim of completeness. But we believe they represent about 80–90 % of all the operations carried out in the laryngeal oncology theatre.

14.1 Laser Cordectomy (Type II)

Endoscopic laser surgery has had a great development in recent years, especially in Europe thanks to the insight and ability of Wolfgang Steiner. In order to standardise the nomenclature of the various operations and thus be able to compare the results of the various case histories, the European Laryngological Society has drawn up a code classifying endoscopic cordectomies of various types, according to the depth and extension of exeresis [1–4]. The operation we are going to discuss in this paragraph is the type most frequently performed.

1 Principles of Operation: It consists of removing the vocal cord tumour, following a dissection plane that lies below the vocal ligament. The aim is both therapeutic and diagnostic, since it is quite rightly becoming less frequent to carry out a biopsy prior to operation in initial lesions of the cords [5].

2 Indications: dysplasias, carcinomas "in situ", microinfiltrating glottic T1a and T1b

3 Surgical Technique: A satisfactory surgical exposure is fundamental for endoscopic laser surgery. The study of the neoplasia with rigid optics before starting the operation is essential for defining its limits (Fig. 14.1).

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The removal of the ventricular band allows excellent control of the glottis. The cordectomy normally includes all the mucosa of the floor of the ventricle (Fig. 14.2).

Once we have found the plane of the vocal ligament and exposed the surface of the vocal muscle, these are dissected until we reach the caudal limit of the vocal

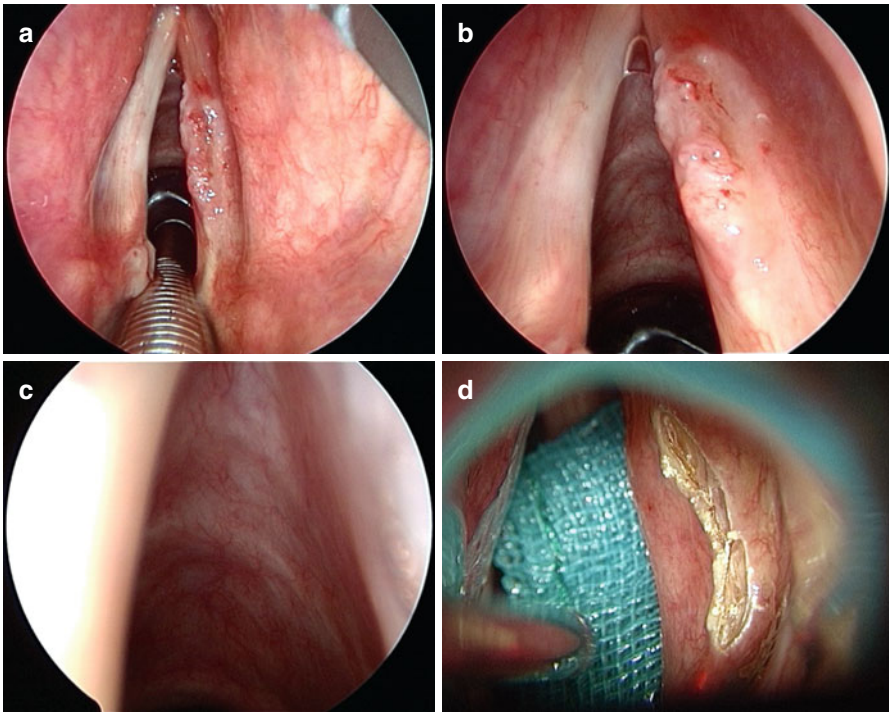


Fig. 14.1 Laser Cordectomy (Type II) T1a epidermoid carcinoma of the right vocal cord (**a**); the floor of the ventricle is free from disease (**b**); as is the subglottis (**c**); applying a protection on the cord plane, the ventricular fold is resected so as to see and work better on the glottis below (**d**)

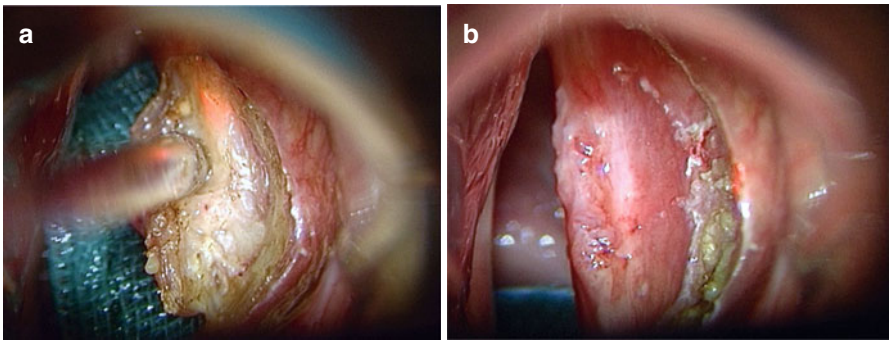
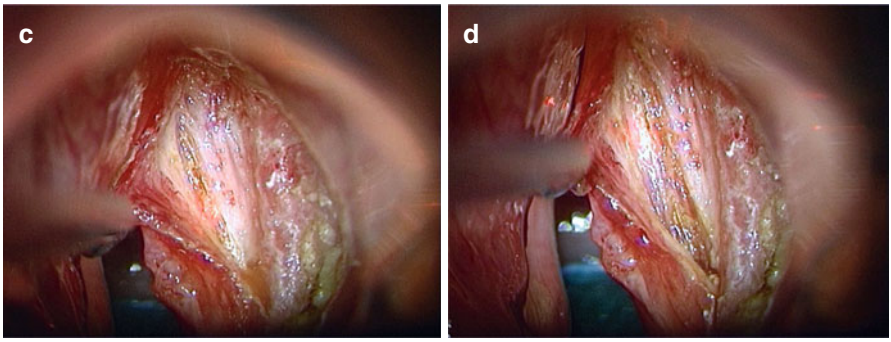


Fig. 14.2 Laser Cordectomy (Type II) The ventricular band is completely removed (**a**, **b**); the ventricle mucosa is pulled medially and dissected from the vocal muscle below (**c**, **d**)



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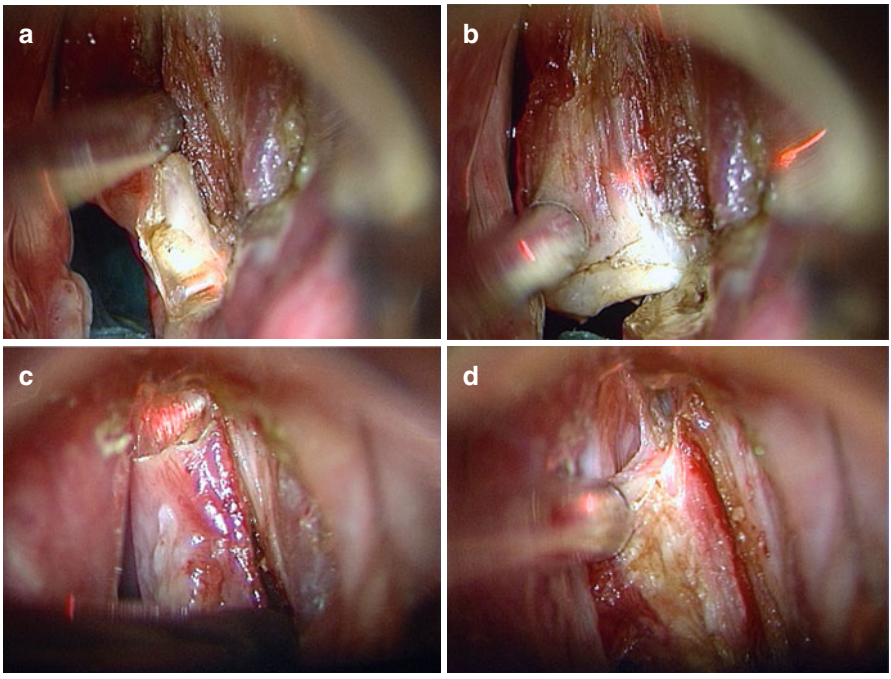


Fig. 14.3 Laser Cordectomy (Type II) The vocal ligament is sectioned immediately in front of the vocal process of the arytenoid (**a**, **b**); the anterior section is close to the anterior commissure (**c**, **d**)

muscle. The ligament is then resected at its two ends. The resection of the ligament is carried out only at this point so as to keep the cord well taut during dissection of the muscle and ligament (Fig. 14.3).

The vocal ligament is separated from the vocal muscle, paying attention to the resection margins which must be in healthy tissue (Fig. 14.4).

Exeresis is also completed anteriorly and the specimen is removed and oriented (Fig. 14.5).

Photocoagulation of the mucosal resection margins is then carried out and the field of operation is checked again with rigid optics at the end of the operation (Fig. 14.6).

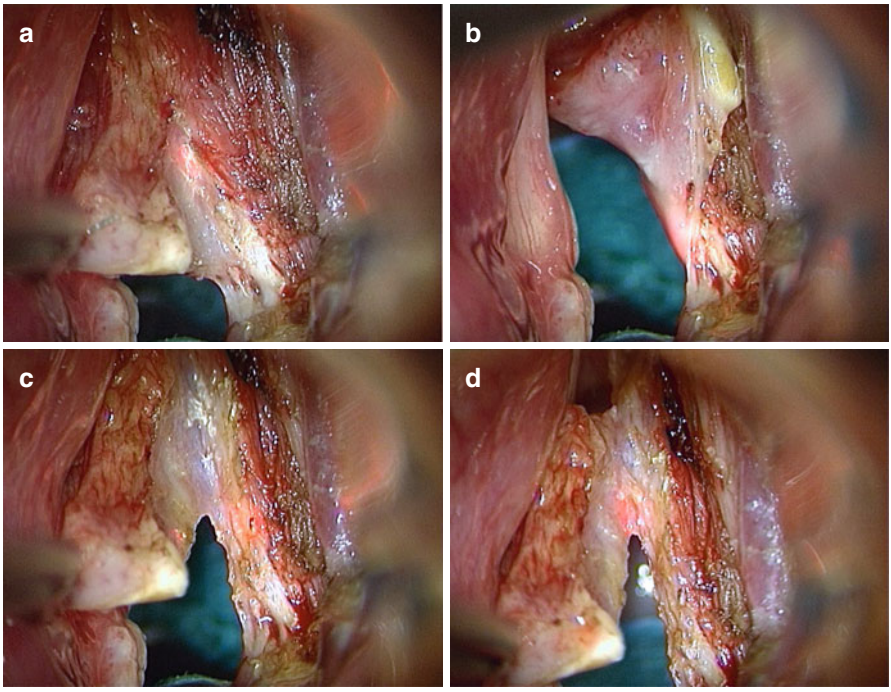


Fig. 14.4 Laser Cordectomy (Type II) The muscle fibres remain on the right while the vocal ligament is on the left; the microforceps grip the caudal end of the specimen and medialise it during dissection (**a**, **c**, **d**); the flap is lateralised at intervals so as to be able to check that the dissection is at a safe distance from the neoplasia (**b**)

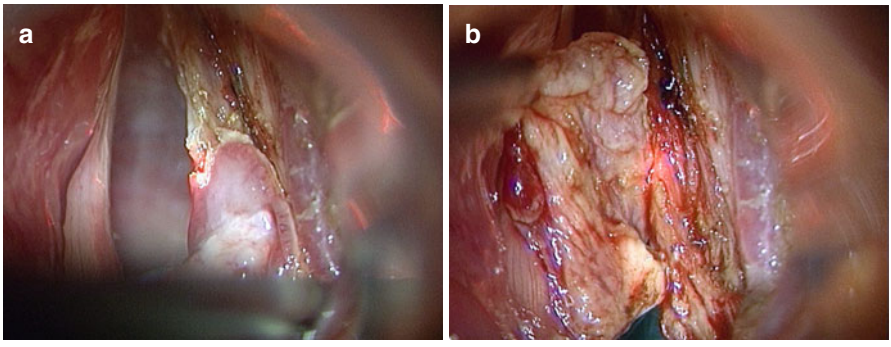
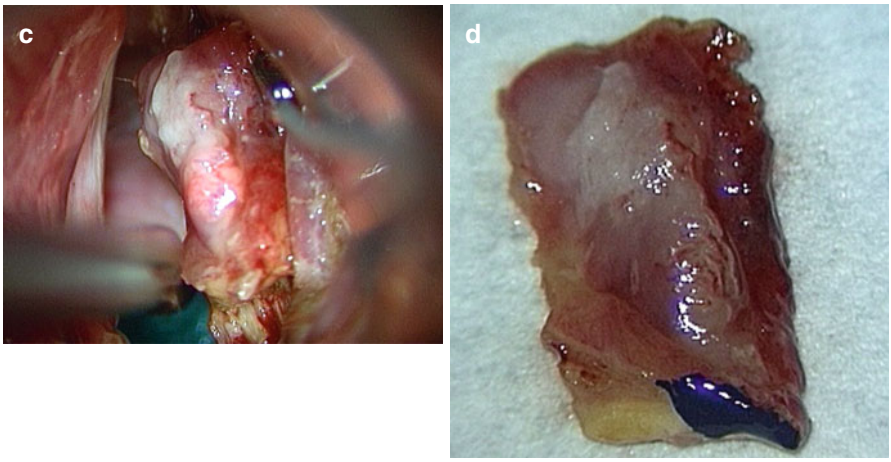


Fig. 14.5 Laser Cordectomy (Type II) Also the anterior margin is at a satisfactory distance from the neoplasia (**a**); the specimen is detached (**b**); it is put back in place to check its margins and orientation (**c**); before sending it for anatomo-pathological testing, the posterior margin of exeresis is marked with Indian ink (**d**)



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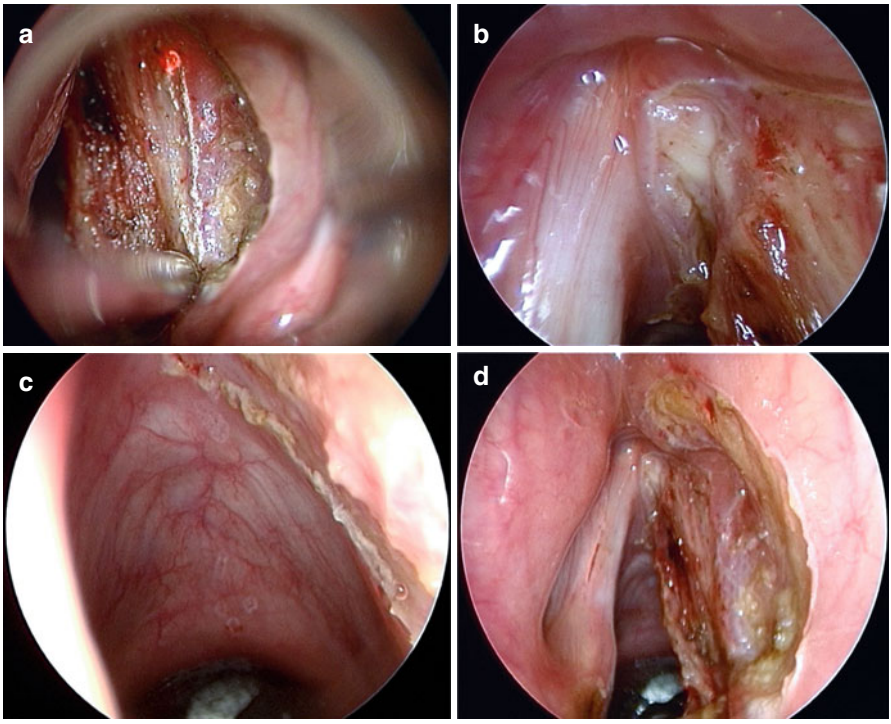


Fig. 14.6 Laser Cordectomy (Type II) Photocoagulation is carried out with a 1.4-mm spot on the mucosal resection margins (**a**); the resection of the vocal ligament can be clearly seen anteriorly (**b**); and caudally the resection margin towards the subglottis (**c**); the last check is for haemostasis (**d**)

4 Remarks: At a distance, type II cordectomy shows excellent functional outcomes, indistinguishable from those achieved with radiotherapy [6]. Laser photocoagulation seems to be effective in disease local control in case of close or superficial margin positivity at postoperative histological examination [7]. Positivity of the profound resection margins requires surgical revision, which in most cases consists of performing a deeper or more extensive cordectomy. In the case of margins with massive involvement, surgery with an external approach is indicated [8].

14.2 Supraglottic Horizontal Laryngectomy

Supraglottic horizontal laryngectomy was conceived by Justo Alonso of Montevideo around 1940 [9]. It resulted from previous anatomical and embryological considerations (Rouvière, Baclesse) [10] that presumed a lymphatic watershed at the level of the laryngeal ventricle which forms an obstacle to the downward spread of vestibular tumours.

1 Principles of the Operation: (a) complete ablation of the laryngeal vestibule, that is, of the portion of the larynx located above the glottic plane (the arytenoids are preserved); (b) ablation of the preepiglottic space; (c) ablation or non-ablation of the hyoid bone; and (d) the exeresis may be extended to one arytenoid, to the piriform sinus or to the tongue base (extended supraglottic laryngectomies), or to one vocal cord (laryngectomy type ¾) (Fig. 14.7a–d)*

2 Indications: T1, T2, and some supraglottic T3

3 Surgical Technique: The incision of the skin preferred is André's bilateral incision and usually laterocervical lymph node dissection is carried out beforehand. The incision involves the cutis, subcutaneous tissue, and the platysma muscle and extends from one mastoid to the other passing a finger's width above the jugulum. The large myocutaneous flap is elevated from the superficial cervical fascia as far as the inferior margin of the mandible. Before proceeding with laryngectomy, we perform the subisthmic tracheostomy. Three silk stitches are prepared at the top which, at the end of the operation, will be sutured to the cutaneous flap. The orotracheal anaesthesia tube is then replaced. At this point, we can proceed with the laryngectomy, after ligating the superior laryngeal pedicles and preserving the nerve (Fig. 14.8).We identify the greater cornu of the hyoid bone and section the supra- or subhyoid muscles (depending on whether the hyoid bone is to be preserved or not), remaining close to the bone to avoid damaging the lingual artery, which lies immediately underneath (Fig. 14.9).

This exposes the adipose tissue of the preepiglottic cavity which will be accurately removed with the specimen (Fig. 14.10).

We then section the subhyoid muscles horizontally at the level of the thyrohyoid membrane, thus revealing the superior portion of the thyroid cartilage. Now, we cut the external thyroid perichondrium along the superior margin of the thyroid cartilage, from the laryngeal prominence to the base of the superior cornu on each side (Fig. 14.11).

*The drawings in this chapter came from "G. Carlon, II carcinoma della laringe: dalla patologia alla clinica, Ed. Piccin Padua" with the permission of the editor.

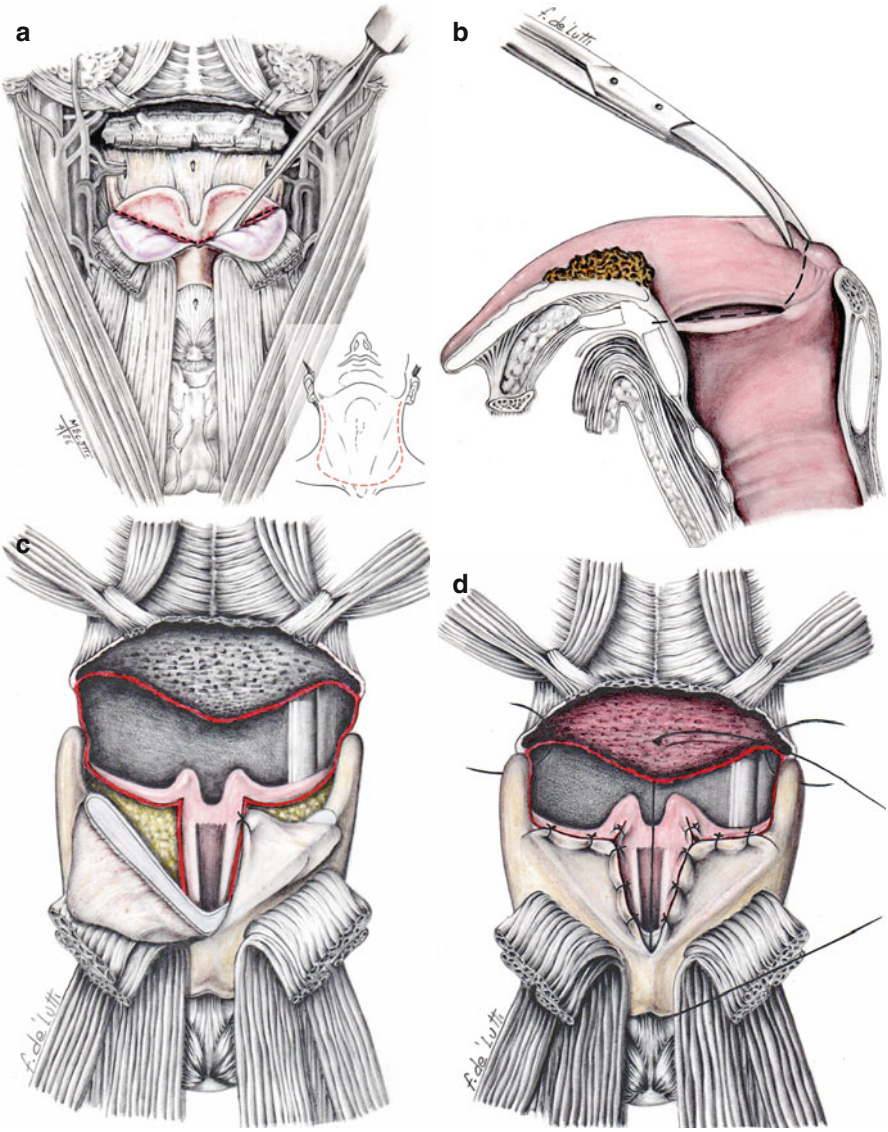


Fig. 14.7 Supraglottic Horizontal Laryngectomy: surgical steps (**a**) (1) large myocutaneous flap, (2) subisthmic tracheostomy, (3) ligating the superior laryngeal pedicles, (4) section the supra- or subhyoid muscles, (5) clearance of preepiglottic space, (6) resection and detaching of thyroid perichondrium, (7) resection of thyroid cartilage (**b**). (1) horizontal section in front of arytenoid cartilage, along the ventricle as far as anterior commissure (2) section line through the glossoepiglottic valleculae and the aditus of piriform sinus (**c**) reconstruction of the glottic plane with the perichondrium (**d**) (1) pexy between the base of tongue (the hyoid bone when preserved) and the residual thyroid cartilage (2) second suture layer between the subhyoid muscles and the suprahyoid cervical fascia

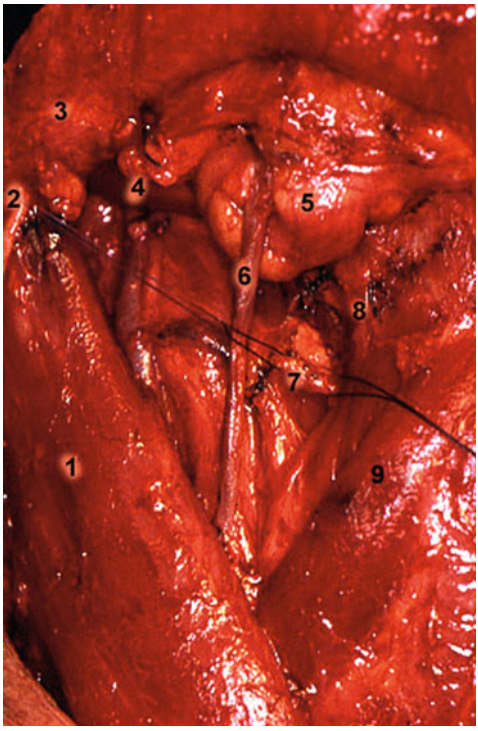


Fig. 14.8 *1* Sternocleidomastoid muscle, *2* great auricular nerve, *3* parotid gland, *4* digastric muscle, *5* submandibular gland, *6* retromandibular vein, *7* superior laryngeal artery and vein, *8* hyoid bone, *9* subhyoid muscles

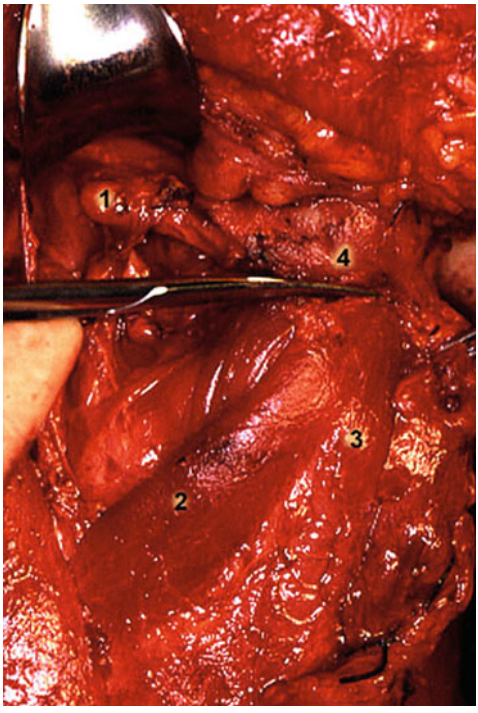


Fig. 14.9 *1* Apex of the greater cornu of the hyoid bone, *2* omohyoid muscle, *3* sternohyoid muscle, *4* body of the hyoid bone

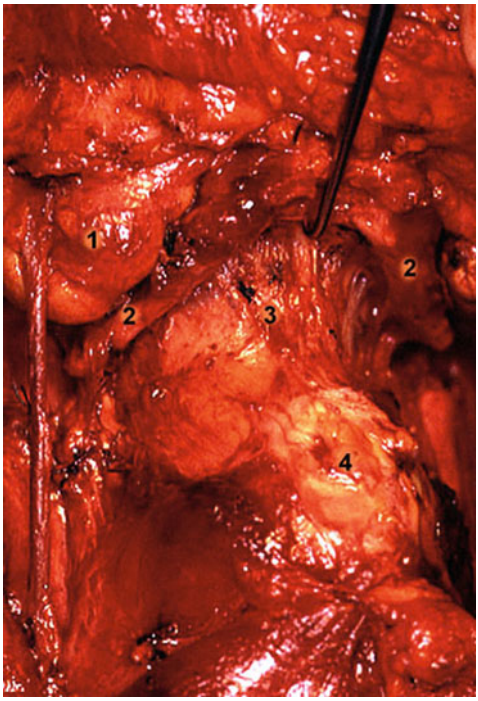


Fig. 14.10 *1* Submandibular gland, *2* greater cornu of the hyoid bone, *3* preepiglottic space (cleared), *4* adipose tissue of the preepiglottic space (lifted down)

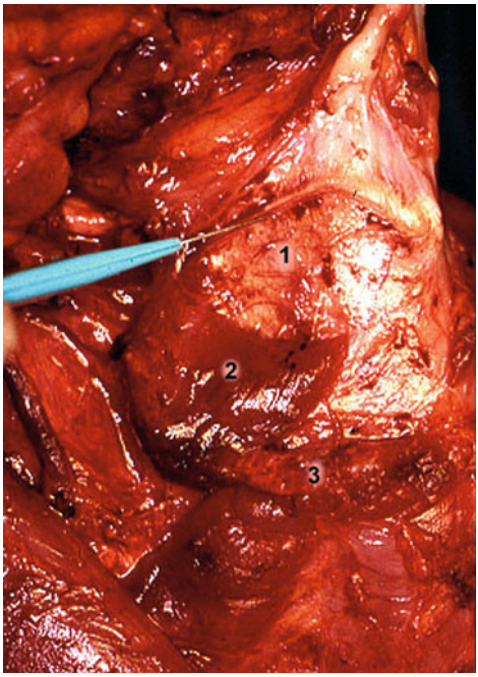


Fig. 14.11 *1* Right thyroid lamina, *2* thyrohyoid muscle (sectioned), *3* subhyoid muscles (sectioned)

First with an angled separator and then with a dry gauze swab, the perichondrium is elevated downwards on both sides, as far as the line that joins the base of the superior cornu to the small cartilage depression internally corresponding to the anterior commissure. Along this same ideal line, we then proceed with the bilateral elevation of the internal thyroid perichondrium, so as to create two subperichondrial supraglottic tunnels, converging above the anterior commissure (Fig. 14.12).

The thyroid cartilage is then sectioned along the same line with the Lister's scissors, inserting the distal blade in the subperichondrial tunnels (Fig. 14.13).

We proceed with supraglottic laryngectomy using as mode of access the pharyngostome made in the side wall of the piriform sinus, choosing the side less affected by the neoplastic lesion. The section is extended to the mucosa of the glossoepiglottic valleculae and at this point a good exposure of the neoplasia is usually possible (Fig. 14.14).

The section continues down towards the entrance to the piriform sinus and then runs obliquely along the anterior aspect of the arytenoid cartilage, then becomes horizontal along the floor of the ventricle, as far as the anterior commissure. The same route is followed on the other side (Fig. 14.15).

The glottic plane is reconstructed using the two triangles of external perichondrium, preserved during the demolitive phase of the operation, which are turned back to cover the section edges of the thyroid cartilage and the inferior paraglottic spaces. We fix the apex of the triangle to the mucosa that covers the vocal process of the arytenoid cartilage; we suture the medial side of the triangle with the lateral

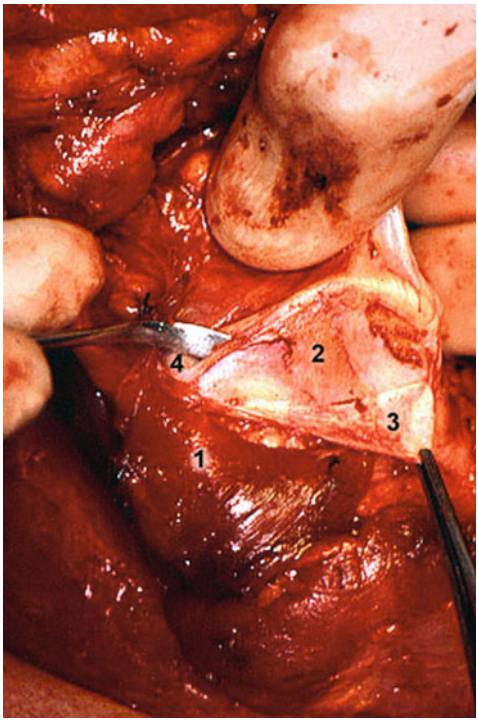


Fig. 14.12 *1* Thyrohyoid muscle (sectioned), *2* right thyroid lamina, *3* external perichondrium, *4* internal perichondrium

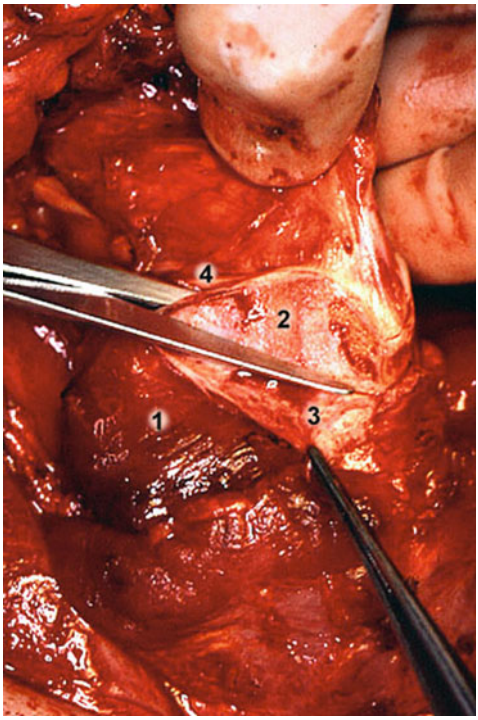


Fig. 14.13 *1* Thyrohyoid muscle (sectioned), *2* right thyroid lamina, *3* external perichondrium, *4* internal perichondrium

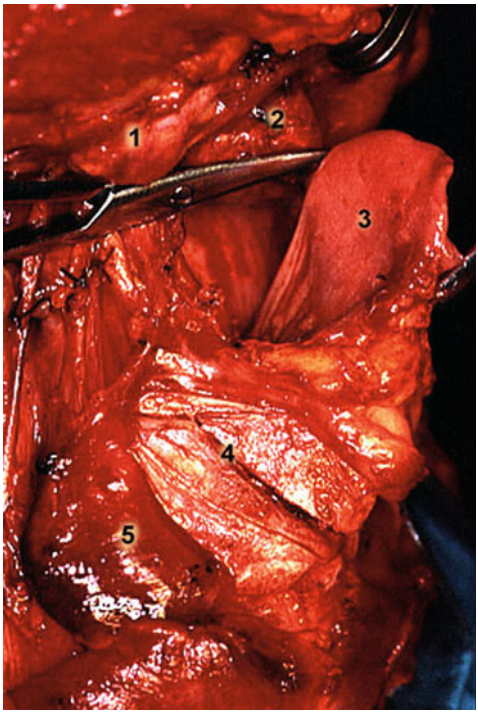


Fig. 14.14 *1* Greater cornu of the hyoid, *2* tongue base, *3* epiglottis, *4* thyroid lamina, *5* thyrohyoid muscle

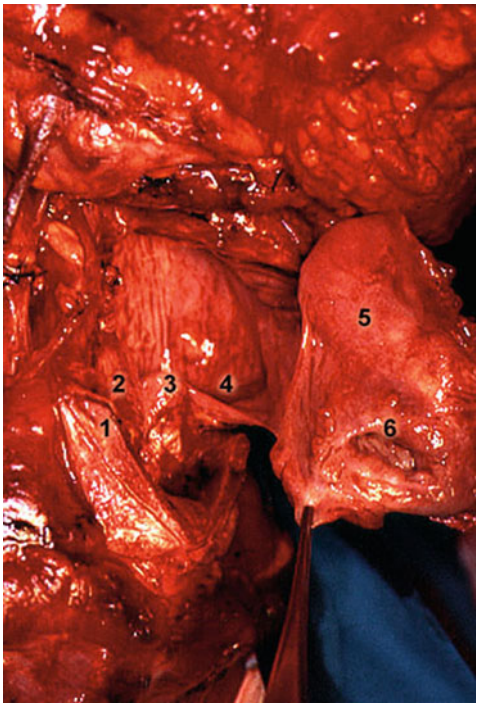


Fig. 14.15 *1* Thyroid lamina, *2* right arytenoid, *3* left arytenoid, *4* entrance to the left piriform sinus, *5* epiglottis, *6* carcinoma of the left vestibule (ventricular fold and infrahyoid epiglottis)

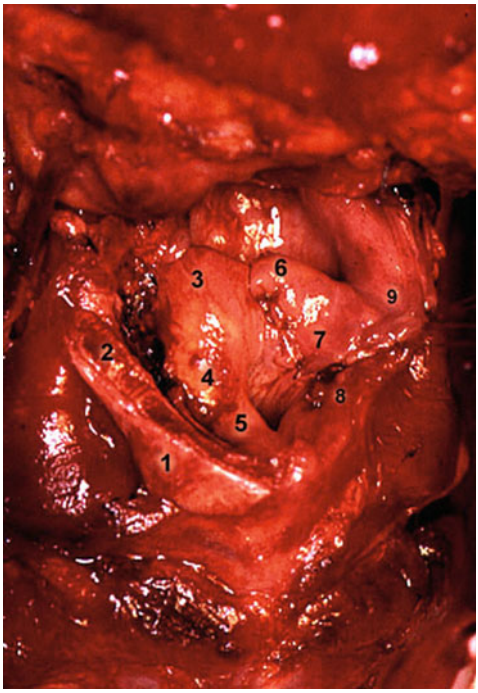


Fig. 14.16 *1* Right external perichondrium, *2* right thyroid lamina, *3* apex of right arytenoid, *4* vocal process of right arytenoid, *5* right vocal cord, *6* apex of left arytenoid, *7* mucosa of the left piriform recess, stretched forward, *8* left external perichondrium, everted back

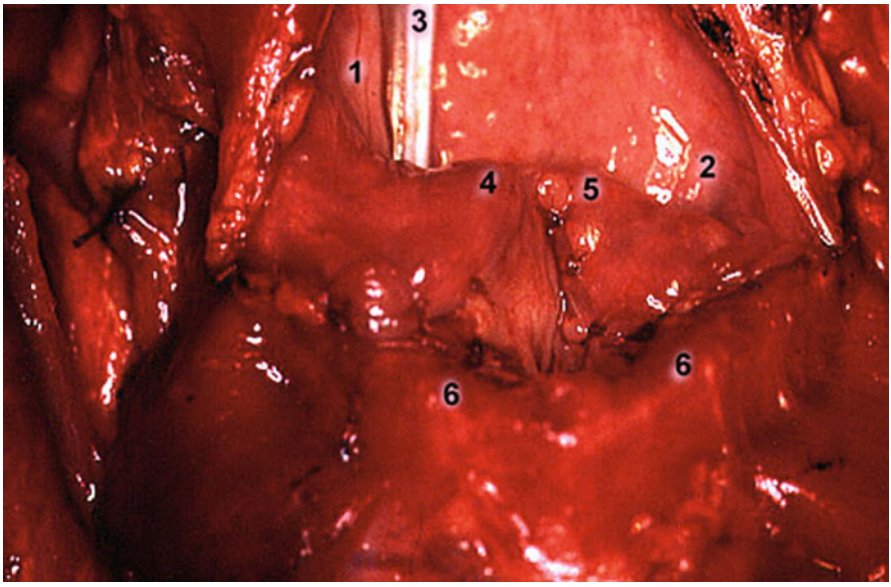


Fig. 14.17 *1* Entrance to the right piriform sinus, *2* entrance to the left piriform sinus, *3* feed tube, *4* apex of right arytenoid, *5* apex of left arytenoid, *6* thyroid lamina covered by external perichondrium

margin of the mucosa covering the vocal cord; we suture the posterior side of the perichondral triangle to the mucosa of the entrance to the piriform sinus. Two stitches restore the continuity of the mucosa on the anterior aspect the arytenoid cartilages (Fig. 14.16).

When reconstruction of the glottic plane is completed, the naso-oesophageal feed tube is inserted (Fig. 14.17).

The restoration of pharyngolaryngeal continuity is achieved by the pexy between the residual thyroid cartilage, hyoid bone, and tongue base. The main median suture surrounds at the centre the inferior edge of the thyroid cartilage piercing the cricothyroid membrane and passes behind the anterior commissure; at the top it pierces, from the inside to the outside, the tongue base in the centre and surrounds the hyoid bone, if preserved. Some secondary lateral stitches are then applied; the most lateral of these perforates the mucosa of the lateral aspect of the piriform sinus and pierces at the top the mucosa of the gingivolingual fornix; the other stitches perforate the thyroid perichondrium at the bottom and the tongue base at the top then surround the greater cornu of the hyoid bone (Fig. 14.18).

After having flexed the patient's neck, all the stitches in this suture are tightened with several knots, with perfect adhesion between the two edges of the suture. We then make a second horizontal suture, with interrupted stitches, between the section margin of the subhyoid muscles and the suprahyoid cervical fascia. The central stitch is "U" shaped; the most lateral stitches of this suture are fixed at the top to the intermediate tendon of the digastric muscle, taking care not to damage the underlying hypoglossal nerve (Fig. 14.19).

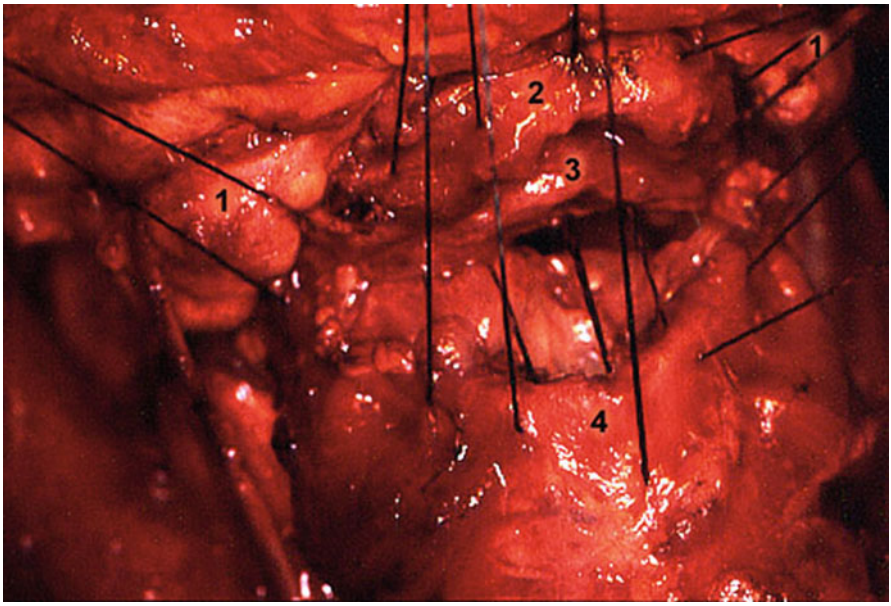


Fig. 14.18 *1* Submandibular gland, *2* hyoid bone, *3* tongue base, *4* thyroid lamina

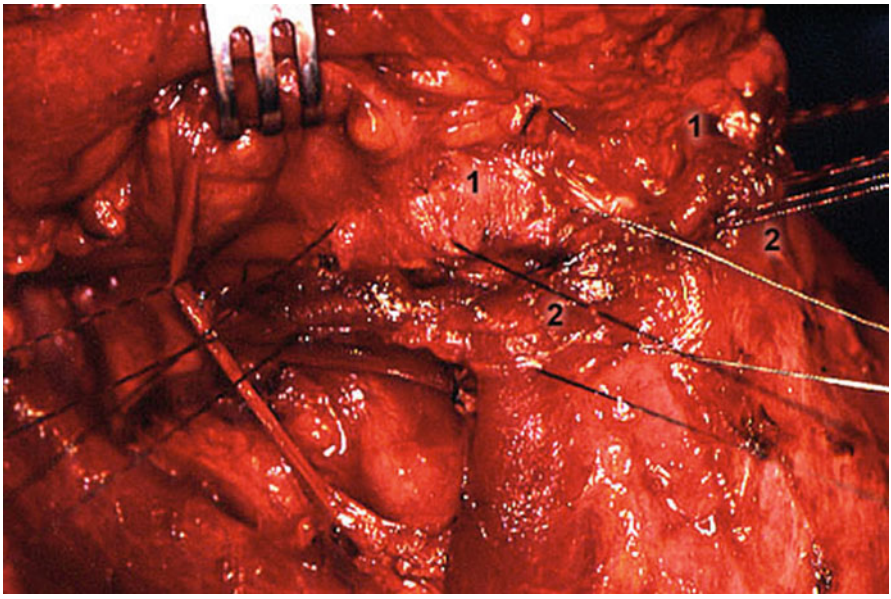


Fig. 14.19 *1* Suprahyoid fascia, *2* subhyoid muscles

At the end of the operation, the pars membranacea of the trachea is sutured to the myocutaneous flap in the centre and suction drains are placed in the laterocervical regions. The cutis and the subcutaneous tissue are sutured on two planes.

14.3 Supracricoid Laryngectomy

Performed for the first time by Foderl in 1896, resumed by Majer in 1959, and relaunched in the clinical field by Serafini [11], Labayle and Bismuth [12], and Piquet et al. [13], reconstructive laryngectomy, better known as supracricoid laryngectomy (SCL), became widely used in Europe only in the second half of the eighties. Nowadays, it is a routine operation in all the most qualified laryngeal oncology centres.

1 Principles of the Operation: SCL has numerous variants, improperly defined by the type of fixation carried out during the reconstructive phase of the operation.

(a) In glottic carcinomas, laryngectomy is performed preserving one or both arytenoids and the superior part of the epiglottis (crico-hyoido-epiglottopexy, CHEP, Mayer–Piquet); (b) in transglottic carcinomas, the operation is performed preserving generally one arytenoid and sacrificing the whole epiglottis with the content of the preepiglottic space (crico-hyoidopexy, CHP, Labayle); (c) in carcinomas with a subglottic extension or which infiltrate the inferoposterior paraglottic space and/or the cricoarytenoid articulation, supratracheal laryngectomy may be indicated, preserving a "cricoarytenoid unit" (tracheo-hyoido-epiglottopexy, THEP, Rizzotto–Serafini) [14] (Fig. 14.20a–d).

2 Indications: some T1b, some transglottic T2–T3–T4

3 Surgical Technique: For the operation limited to the larynx, we make a superficial "apron" incision with good exposure of the anterior cervical region from the hyoid bone to the jugulum. André's bilateral incision, with exposure also of the laterocervical regions, is preferable if lymph node dissection is expected. Surgery on the larynx is started at the bottom, exposing the thyroid gland with a section at the base of the neck and upward rotation of the subhyoid muscles (Figs. 14.21 and 14.22).

The thyroid gland is stretched upwards exposing the thyropericardial lamina: the inferior thyroid veins are ligated and sectioned, uncovering the cervical trachea. The recurrent nerves and the inferior thyroid arteries are preserved (Fig. 14.23).

A small tracheostomy is then made at the level of the fourth to fifth tracheal ring. Transferring the anaesthesia tube into the tracheostoma, the superior isolation of the larynx begins with the section of the superficial cervical fascia and of the subhyoid muscles along the inferior edge of the hyoid bone and the clearance of the contents of the preepiglottic space which will be removed with the specimen (Fig. 14.24).

The superior vascular pedicles are then ligated and sectioned, preserving the superior laryngeal nerves so as to maintain the sensitivity of the piriform sinuses (Fig. 14.25).

The lateral isolation of the larynx is achieved by sectioning the inferior constrictor muscles and the external perichondrium along the lateral margins of the thyroid cartilage (Fig. 14.26).

Laterally rotating the larynx, the lateral and anterior walls of the piriform sinuses are then separated with an internal subperichondrial approach (Fig. 14.27).

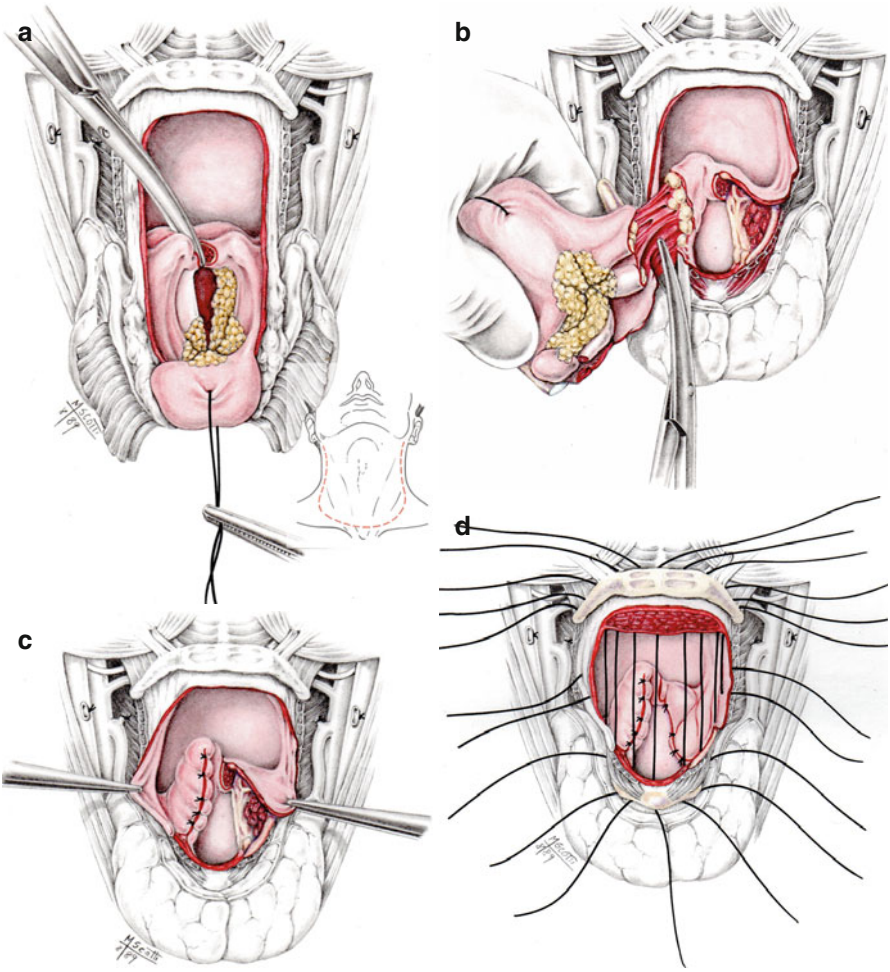


Fig. 14.20 Supracricoid Laringectomy: surgical steps (**a**) (1) André's bilateral incision (if the neck dissections are performed) (2) section of subhyoid muscles at the base of the neck (3) small tracheostomy through the thyropericardial lamina (4) resection of subhyoid muscles along the inferior edge of the hyoid bone and clearance of the preepiglottic space (5) ligatures of superior vascular pedicles (6) section of the inferior constrictor muscle of hypopharynx and detaching of piriform sinuses from the thyroid lamina (7) dissection of the supraglottic larynx and of the posterior commissure (8) tracheostomy (**b**) caudal section along the superior margin of the cricoid cartilage, sparing the arytenoid cartilage on the side lesser involved by the tumour and the piriform sinus too (**c**) reconstruction of a neoglottis (**d**) (1) pexy between the cricoid ring, the tongue base at the top and the body of the hyoid bone (2) second layer between the superior edge of the thyroid gland and the suprahyoid muscles

The inferior thyroid cornua are sectioned at their base and preserved so as not to damage the underlying branches of the recurrent nerves (Fig. 14.28).

SCL may be performed with exeresis from top to bottom or from bottom to top. We prefer the first means of removal in cases with extensive carcinomas involving

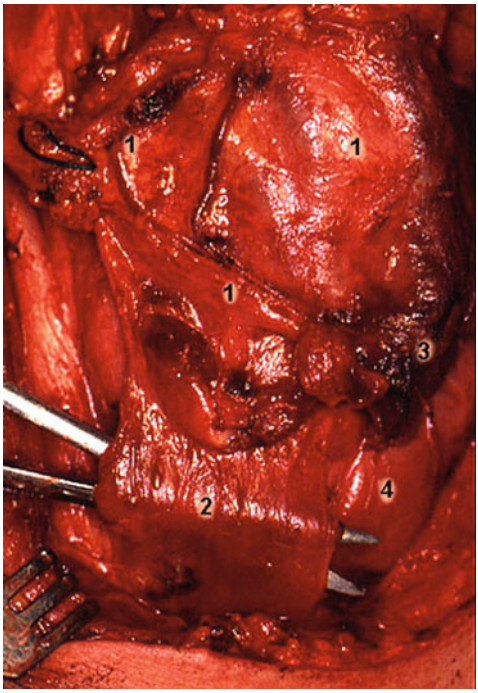


Fig. 14.21 *1* Superficial cervical fascia, *2* right subhyoid muscles, *3* left subhyoid muscles (sectioned), *4* thyroid gland

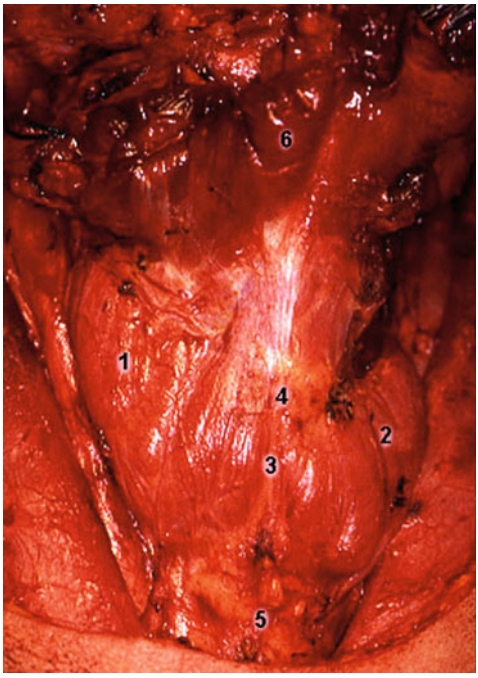


Fig. 14.22 *1* Right thyroid lobe, *2* left thyroid lobe, *3* thyroid isthmus, *4* cricoid cartilage, *5* thyropericardial lamina, *6* infrahyoid muscles

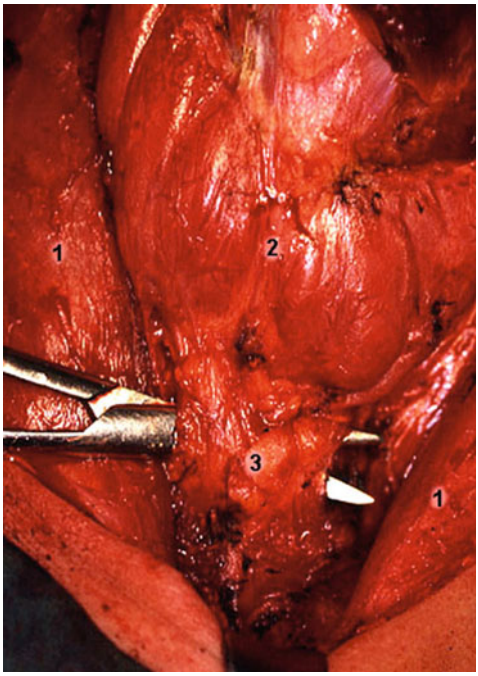


Fig. 14.23 *1* Sternocleidomastoid muscle, *2* thyroid isthmus, *3* thyropericardial lamina

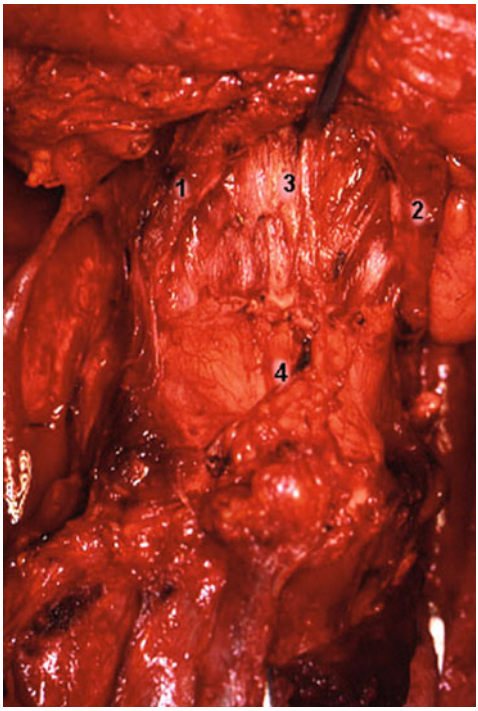


Fig. 14.24 *1* Right greater cornu of the hyoid bone, *2* left greater cornu of the hyoid bone, *3* submucosa of the glossoepiglottic vallecula, *4* content of the preepiglottic space (lifted downwards)

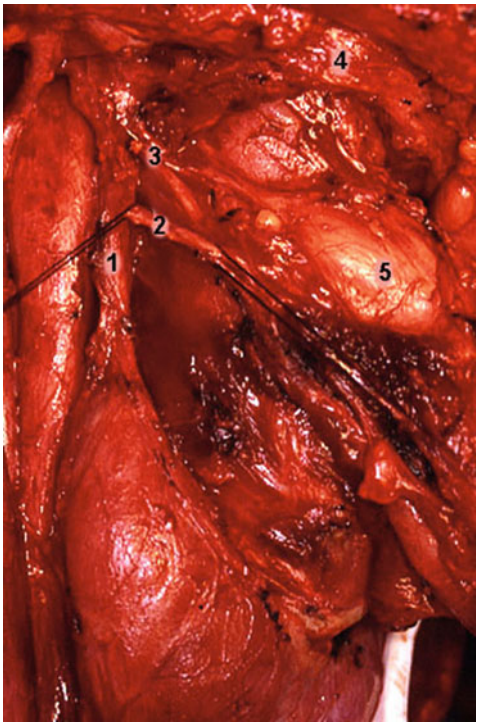


Fig. 14.25 *1* Superior thyroid artery, *2* superior laryngeal artery, *3* superior laryngeal nerve, *4* hyoid bone, 5 preepiglottic space

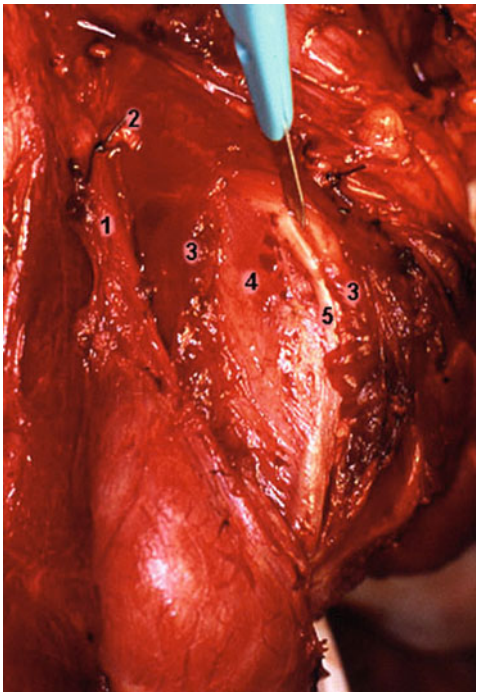


Fig. 14.26 *1* Superior thyroid artery, *2* superior laryngeal artery, *3* inferior constrictor muscle of the pharynx (sectioned), *4* submucosa of the right piriform sinus, *5* thyroid cartilage

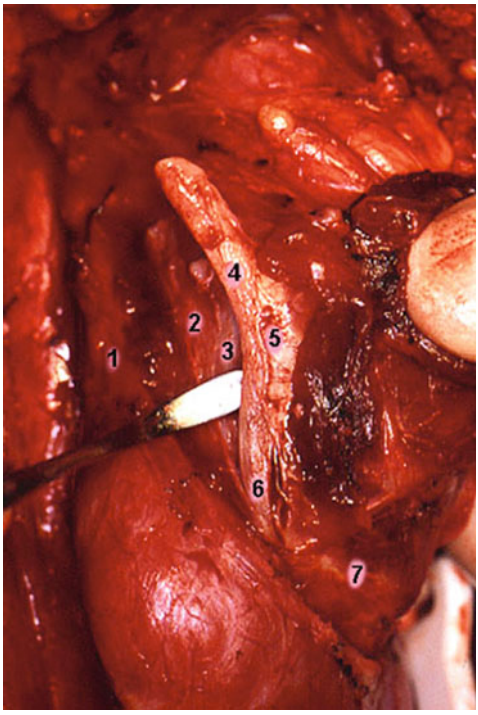


Fig. 14.27 *1* Superior thyroid artery, *2* submucosa of the right piriform recess, *3* internal perichondrium of the right thyroid lamina, *4* right superior cornu of the thyroid cartilage, *5* external perichondrium of the right thyroid lamina, *6* right inferior cornu of the thyroid cartilage, *7* cricoid cartilage

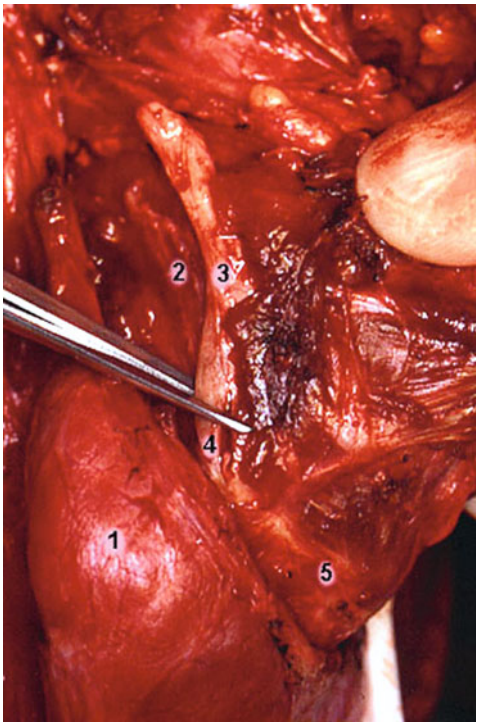


Fig. 14.28 *1* Right thyroid lobe, *2* right piriform recess, *3* thyroid cartilage, *4* right inferior cornu of the thyroid cartilage, *5* cricoid cartilage

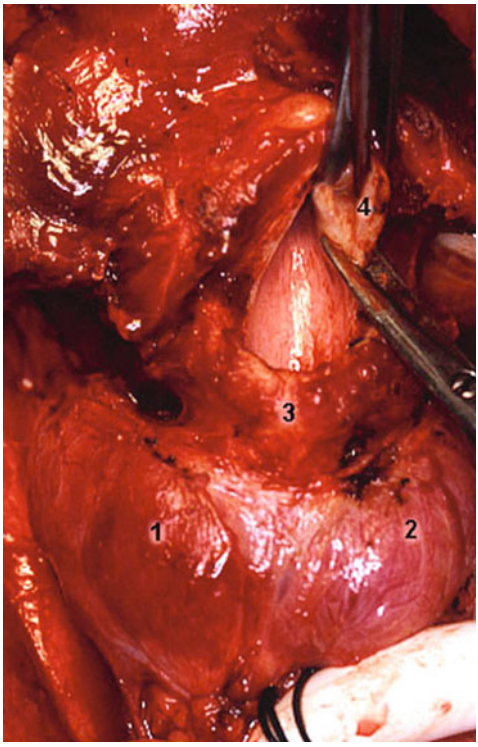


Fig. 14.29 *1* Right thyroid lobe, *2* left thyroid lobe, *3* cricoid cartilage, *4* left vocal cord

the supraglottic region, which require more extensive exeresis with good exposure of the tumour limits (reconstruction with crico-hyoidopexy), the second in cases of glottic carcinoma with the possibility of preserving the epiglottis (reconstruction with crico-hyoido-epiglottopexy).

4 Laryngectomy with Crico-Hyoidopexy (**CHP**): The demolitive phase begins with laryngectomy performed at the level of the superior margin of the cricoid (Fig. 14.29).

The section is prolonged horizontally as far as the vocal process of the side where the arytenoid cartilage is to be preserved then verticalised along the anterior wall of the same (Fig. 14.30).

The section involves the anterior mucosa of the entrance to the piriform sinuses and is horizontalised passing through the glossoepiglottic valleculae.

On the other side, which is the one more affected by the neoplasia, the horizontal section along the superior margin of the cricoid involves the cricoarytenoid articulation and arrives at the posterior commissure (Fig. 14.31).

From there, it goes up along the mucosa of the piriform sinus and joins the contralateral section at the top, thus completing the exeresis of the larynx (Fig. 14.32).

The continuity of the mucosa is reconstructed with absorbable interrupted stitches along the anterior face of the preserved arytenoid and the entrance to the piriform sinus on the same side by stretching the anterior mucosa forwards and fixing it laterally to the superior edge of the cricoid. Also, the anterior margin of the contralateral

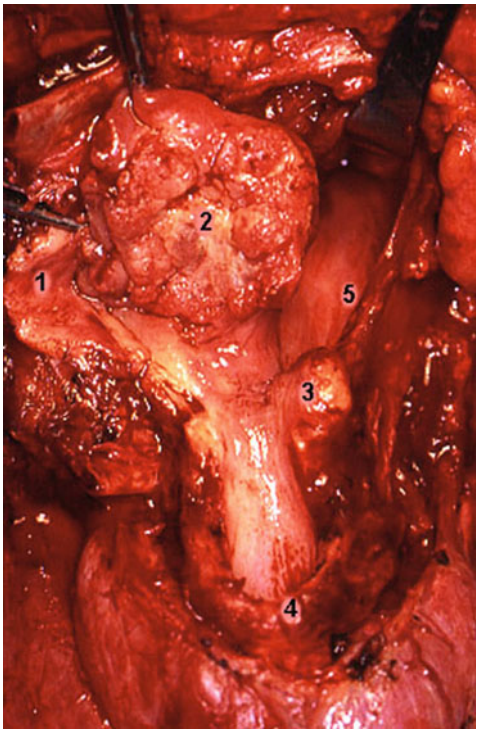


Fig. 14.30 *1* Epiglottis, *2* neoplasia, *3* left arytenoid, *4* cricoid, *5* entrance to the left piriform sinus

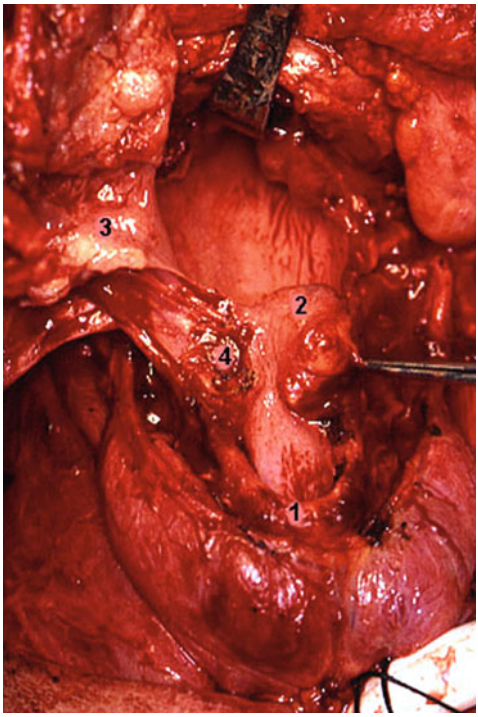


Fig. 14.31 *1* Cricoid cartilage, *2* left arytenoid, *3* right arytenoid, *4* right cricoarytenoid articulation

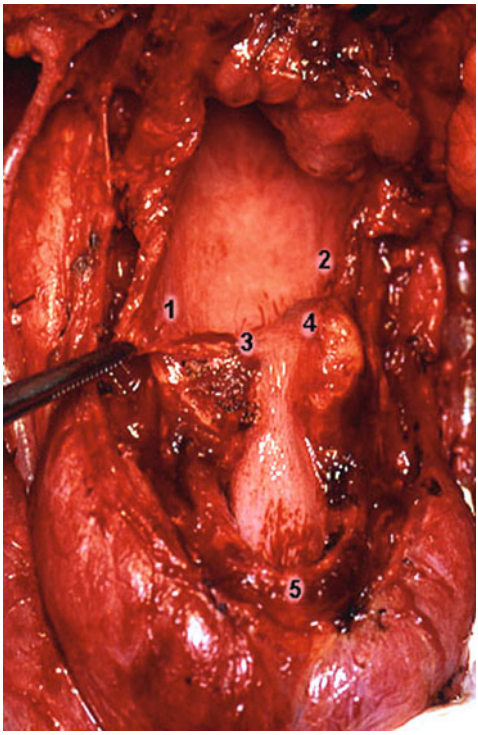


Fig. 14.32 *1* Aditus to the right piriform sinus, *2* aditus to the left piriform sinus, *3* posterior commissure, *4* left arytenoid, *5* cricoid cartilage

piriform sinus is stretched forwards and fixed to the superior edge of the cricoid cartilage (Fig. 14.33).

Once the reconstruction of the mucosa of the opening of the neolarynx has been completed, crico-hyoidopexy is started anteriorly with a central everted stitch of absorbable synthetic thread that surrounds the cricoid ring at the bottom, transfixes the tongue base at the top, and surrounds the body of the hyoid bone. Other sutures fix the cricoid ring to the tongue base and anteriorly to the body of the hyoid bone. The lateral mucosa of the entrance to the piriform sinuses is sutured posteriorly to the mucosa of the glosso-tonsillar sulci, taking care to include in the stitch also the greater cornu of the hyoid bone, which will have the function of keeping wide the entrance of the hypopharynx (Fig. 14.34).

5 Laryngectomy with Crico-Hyoido-Epiglottopexy (CHEP): SCL with crico-hyoido-epiglottopexy, indicated as mentioned above for glottic lesions, requires instead an approach from top to bottom, starting from the piriform sinus of the side less affected by the neoplasia and preserving the subhyoid epiglottis.

Crico-hyoido-epiglottopexy is performed with the same procedure as crico-hyoidopexy: the only difference is in the anterior central stitch which transfixes the epiglottis in the centre 5 mm above the inferior edge of the section before surrounding the body of the hyoid bone at the top. The two anterolateral stitches also transfix the epiglottis laterally and the two most lateral stitches join the anterior mucosa of the entrance to the piriform sinus to the pharyngoepiglottic fold.

Lastly, it must be stressed that the preservation of the piriform sinus in the demolitive phase often makes it superfluous to reconstruct the glottic plane before

Fig. 14.33 *1* Entrance to the right piriform sinus, *2* entrance to the left piriform sinus, *3* left arytenoid, *4* hyoid, *5* cricoid cartilage

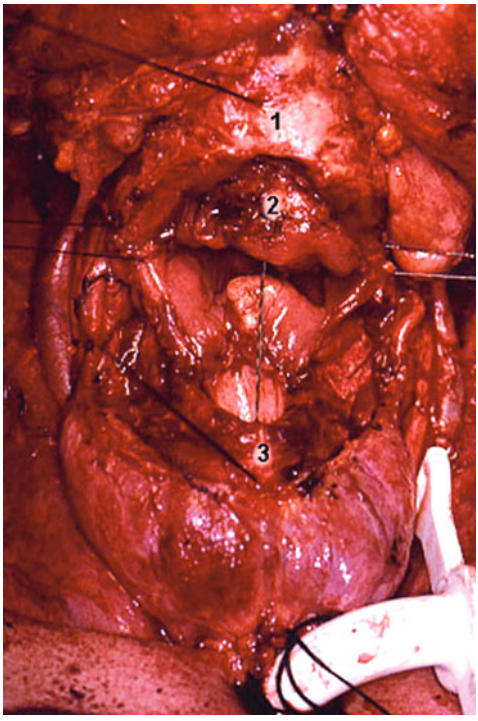


Fig. 14.34 *1* Hyoid, *2* tongue base, *3* cricoid cartilage

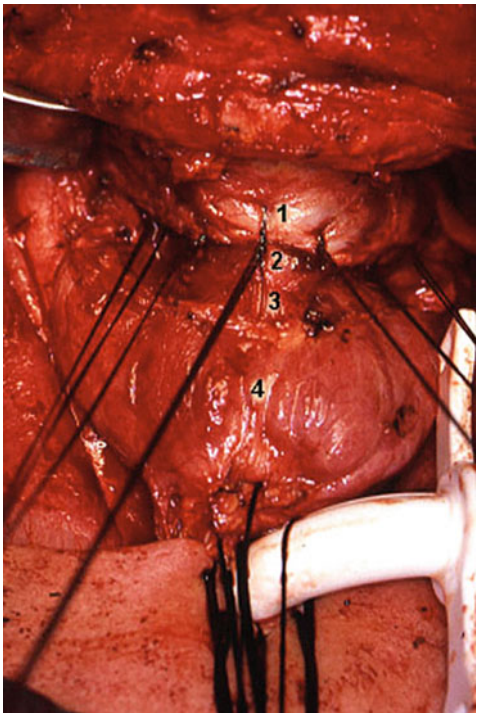


Fig. 14.35 *1* Hyoid, *2* cricoid, *3* trachea, *4* thyroid isthmus

plexy. It has also been demonstrated that the integrity of the piriform sinus appreciably favours the functional recovery of deglutition.

6 The subsequent reconstruction times are identical for both operations. Pexy is accomplished by ligating the sutures, with consequent raising of the cricoid with the cervical trachea/thyroid gland complex and lowering of the hyoid bone with the tongue base (Fig. 14.35).

A second suture is made with interrupted stitches of absorbable synthetic thread between the superior edge of the thyroid gland and the suprahyoid muscles. The thyroid gland thus covers and protects the region of the crico-hyoidopexy and its fixture to the suprahyoid muscles helps stabilise the neolarynx in the definitive position (Fig. 14.36).

7 Laryngectomy with Tracheo-Hyoido-Epiglottopexy (THEP) [14]: One of the contraindications for SCLs is the subglottic extension (selective neck dissection of the recurrential regions is mandatory, Fig. 14.37a) or the involvement of the cricoarytenoid joint.

In this case, the exeresis of a large part of the cricoid is then proposed and then the preservation of a portion of the cricoid lamina with the corresponding arytenoid, called "the cricoarytenoid unit" (Fig. 14.37b).

The neoglottis is reconstructed using the mucosa of the piriform sinus from the side without the arytenoid, which is stretched cranial, folded downwards, and sutured to the mucosa remaining after exeresis (Fig. 14.37c).

The next step is the tracheo-hyoido-epiglottopexy (THEP). The tracheostomy must be very low, because the trachea must be stretched very high up to allow anas-

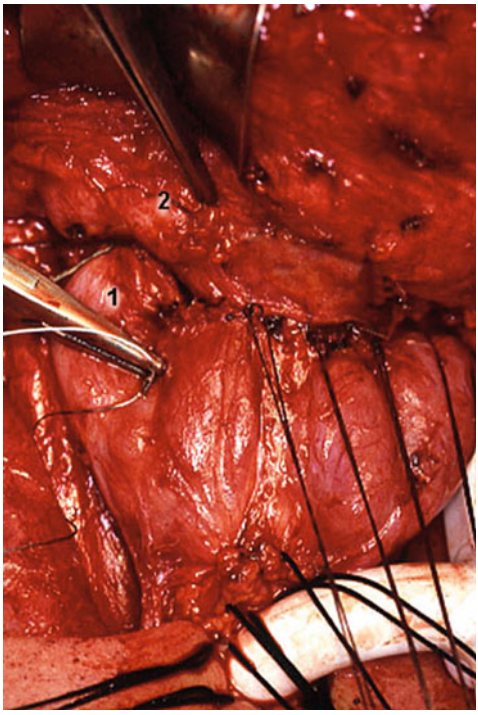
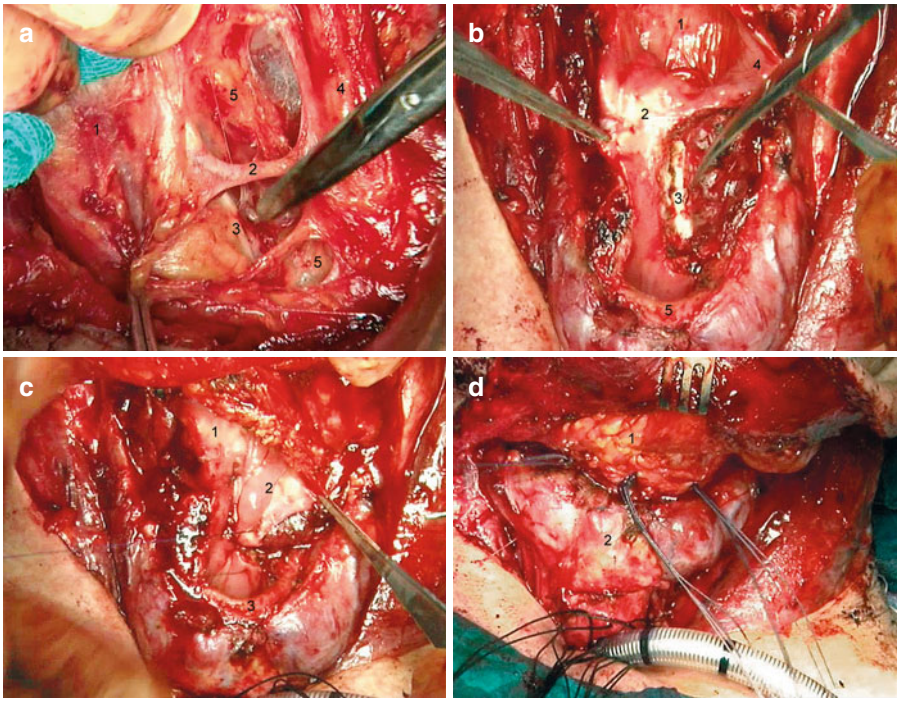


Fig. 14.36 *1* Right thyroid lobe, *2* suprahyoid cervical fascia



tomosis. In the reconstructive phase, it is necessary to flex the head on the neck (Fig. 14.37d).

14.4 Glottic–Subglottic Laryngectomy

The removal of the subglottic or glottic–subglottic segment of the larynx with reconstruction by means of terminoterminal anastomosis is the operation preferred in the treatment of severe subglottic or glottic–subglottic post-traumatic or iatrogenic stenosis. This operation was introduced in the oncological field by Bartual (1978) and it may be used in a number of extremely limited and selected cases.

1 Principles of the Operation: (a) horizontal removal of the inferior segment of the larynx, extending to the first tracheal rings, preserving the laryngeal vestibule and the arytenoids with the interarytenoid fold; (b) reconstruction with tracheolaryngeal continuity by means of terminoterminal anastomosis; and (c) provisional subisthmic tracheotomy (Fig. 14.38a–d).

2 Indications: The operation, which is vertically specular with respect to the supraglottic operation, can be used only for neoplasias confined below the glottic plane, with a modest subglottic extension and without signs of deep infiltration, that is, T1 and T2 (with preserved cord mobility).

N.B.: Subglottic primary carcinomas (fortunately very rare) and glottic–subglottic ones (more frequent) are an extremely severe pathology due to the lateness of the diagnosis and to the possibility of extralaryngeal and lymph nodal spread of the tumour. The treatment chosen is total laryngectomy, extended to the thyroid gland and to the first tracheal rings with contemporary recurrential lymph node clearance followed by radiotherapy on T and N. Only a very limited and carefully selected number of initial glottic–subglottic carcinomas (limited extension, low histological grading) can be treated with partial glottic–subglottic surgery followed or not by radiotherapy on the recurrential lymph node chains.

3 Surgical Technique: An "apron" incision is made, involving the cutis, subcutaneous tissue, and the platysma muscle, with elevation of the myocutaneous flap up to the level of the hyoid bone. The superficial and middle cervical fascia are separated together with the subhyoid muscles on the linea alba, with good exposure of the larynx and of the thyroid gland. The thyroid gland is elevated from the cricoid and from the first tracheal rings, then subisthmic tracheotomy[1] is performed. The

[1] In the case illustrated, the patient had already undergone transisthmic tracheotomy for acute dyspnoea.

Fig. 14.37 Tracheo-hyoido-epiglottopexy (**a**) Dissection of recurrent area *1* trachea, *2* inferior thyroid artery, *3* recurrent nerve, *4* common carotid artery, *5* recurrent lymph nodes. (**b**) Laryngectomy *1* hypopharynx posterior wall, *2* right arytenoid, *3* portion of cricoid cartilage, *4* mucosa of left piriform sinus, *5* first tracheal ring. (**c**) Neoglottic reconstruction *1* right arytenoid, *2* mucosa of left piriform sinus, *3* first tracheal ring. (**d**) Tracheo-hyoidopexy and second plane between thyroid gland and suprahyoid fascia *1* hyoid bone and suprahyoid fascia, *2* thyroid

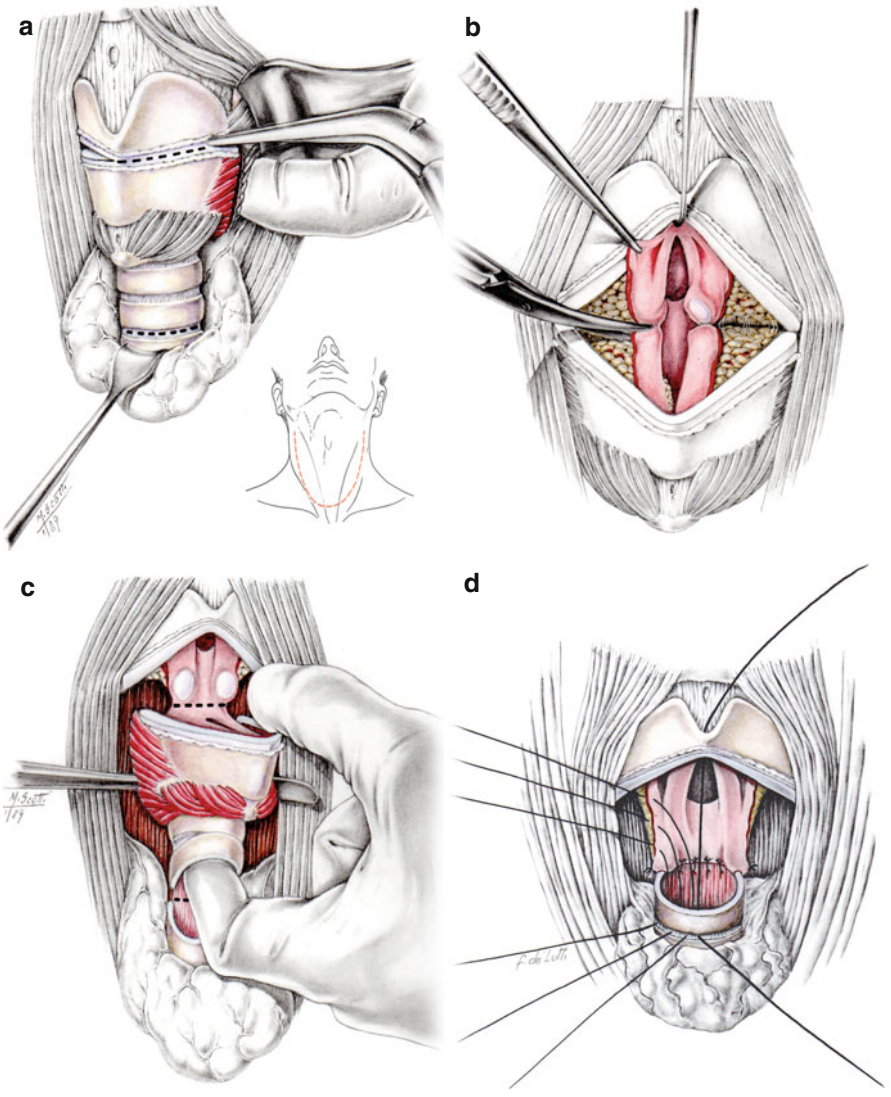


Fig. 14.38 Glottic–subglottic Laryngectomy: surgical steps (**a**) (1) "apron" incision (2) the subhyoid muscles are separated on the linea alba (3) subisthmic tracheostomy (4) the inferior constrictor muscles of the pharynx are sectioned (5) horizontal section of perichondrium and of the thyroid cartilage (6) section of the trachea between second and third ring (**b**) section of the anterior commissure and of Morgagni's ventricle passing through the cricoarytenoid joints (**c**) (1) cricoid cartilage and trachea are separated from hypopharynx and from oesophagus (2) section of subarytenoid posterior laryngeal mucosa with exeresis of laryngotracheal portion (**d**) (1) terminoterminal anastomosis between supraglottic larynx and trachea (2) second suture layer is made between the thyroid gland and the thyrohyoid membrane

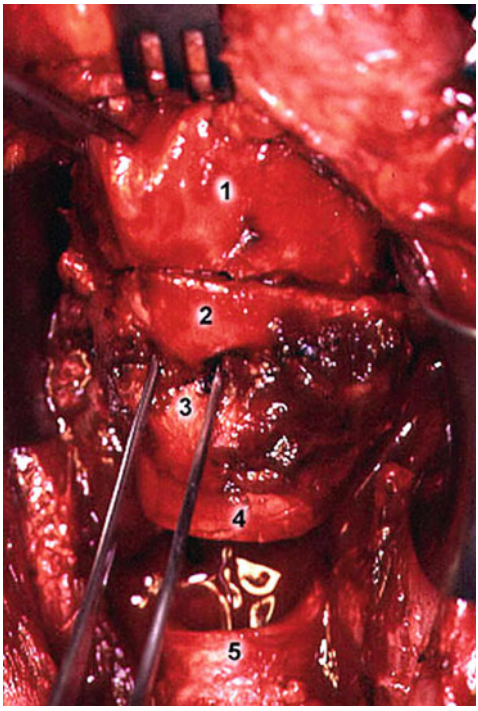


Fig. 14.39 *1* Thyroid lamina (preserved portion), *2* thyroid lamina (removed portion), *3* cricoid, *4* tracheal ring, *5* trachea

external thyroid perichondrium is cut along the line corresponding internally to the superior surface of the vocal cords.

The inferior constrictor muscles of the pharynx are sectioned on both sides along the posterior edges of the thyroid cartilage to be removed, and the anterior wall of the piriform recesses is elevated from the cartilage.

Horizontal supraglottic dissection is then performed along the line of the previous incision of the external perichondrium and the trachea is sectioned between the second and the third ring, anteriorly and laterally (Fig. 14.39).

After opening the larynx at the anterior supracommissural level and sectioning the mucosa along the lateral wall of the ventricle as far as the arytenoids, we proceed to disarticulate the arytenoids from the cricoid (Fig. 14.40).

At this point, the posterior wall of the cricoid and the wall of the superior segment of the trachea are separated from the anterior wall of the hypopharynx and from the cervical oesophagus. The exeresis of the laryngotracheal portion to be removed is now easy by sectioning the subarytenoid posterior laryngeal mucosa and the posterior tracheal wall between the second and the third ring (Fig. 14.41).

The reconstruction of laryngotracheal continuity begins posteriorly by fixing the bases of the arytenoids to the posterior ends of the superior tracheal ring (Fig. 14.42).

A suture is made between the edge of sectioning of the interarytenoid mucosa and the superior edge of the posterior wall of the trachea. The terminoterminal anastomosis is completed laterally and anteriorly by suturing the superior tracheal ring to the inferior

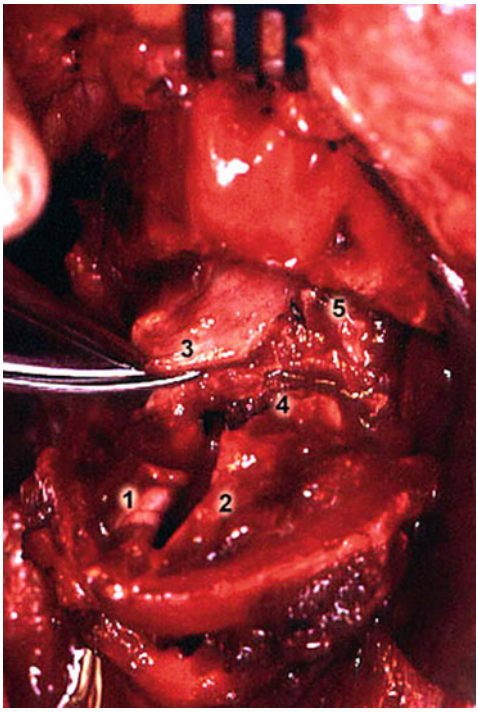


Fig. 14.40 *1* Right vocal cord, *2* left vocal cord, *3* right arytenoid mucosa, *4* left cricoarytenoid articulation, |*5* left arytenoid (disarticulated)

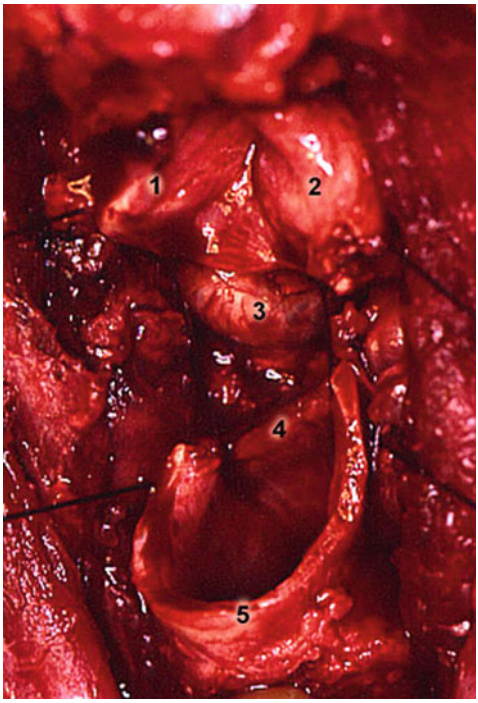


Fig. 14.41 *1* Right arytenoid, *2* left arytenoid, *3* hypopharynx, *4* pars membranacea of the trachea, *5* tracheal ring

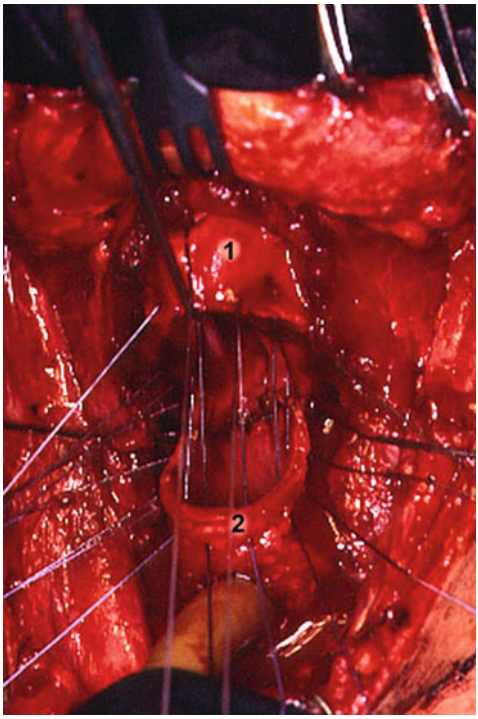


Fig. 14.42 *1* Thyroid lamina, *2* tracheal ring

edges of the lateral mucosa of the ventricles. An anterior anchoring suture surrounds the tracheal ring at the bottom and the thyroid cartilaginous isthmus at the top.

After completing laryngotracheal terminoterminal anastomosis (Fig. 14.43), a second suture is made between the superior edge of the thyroid gland and the thyrohyoid membrane, thus obtaining a good protection of the anastomotic line and a reinforcement ensuring that the union between the two structures is perfectly maintained.[2]

At this point, the operation is completed by suturing together the medial edges of the sternohyoid muscles, placing suction drains, superiorly finishing off the union of the tracheostoma to the cutis, and suturing the cutis on two levels.[3]

14.5 Total Laryngectomy

The conception of this surgical procedure is shared by P. Watson, who was probably the first to perform it (1866), and A.C. Billroth who performed it successfully and provided a complete description [15]. Despite the subsequent spread of various possibilities for

[2]In the case illustrated, since a large part of the thyroid gland is missing, the plane of reinforcement is constructed between the superior peritracheal tissue and the subhyoid cervical fascia.

[3]The neoplasia (in this case, an adenoid cystic carcinoma of the subglottis) can be clearly seen by observing the specimen from the tracheal side (Fig. 14.44).

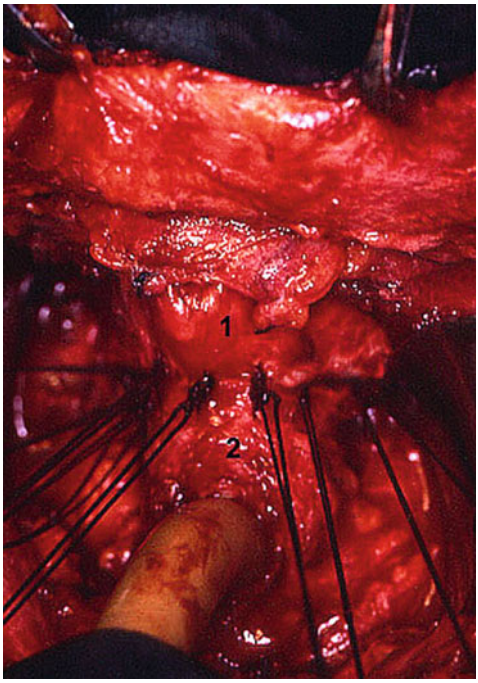


Fig. 14.43 *1* Thyroid cartilage, *2* trachea

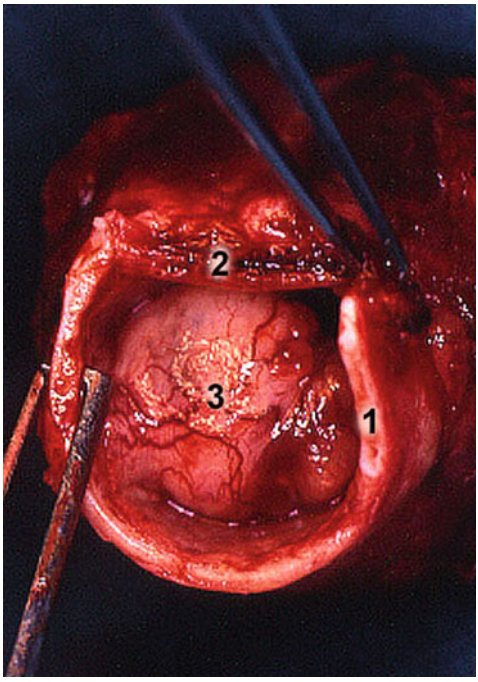


Fig. 14.44 *1* Tracheal ring, *2* pars membranacea of the trachea, *3* neoplasia

preservation surgery, even today, total laryngectomy is indicated in about a quarter of all laryngeal neoplasias, especially in advanced lesions.

1 Principles of the Operation: (a) ablation of the whole larynx from the first tracheal ring to the tongue base (this may be extended to the adjacent tissues, e.g. the piriform sinus, thyroid, trachea, tongue base), (b) reconstruction of the pharyngoesophageal alimentary canal, separating it from the airway, (c) anastomosis of the tracheal opening to the precervical cutis (definitive tracheostoma), and (d) possibility of creating a primary phonatory fistula (Fig. 14.45a–d).

2 Indications: some glottic–subglottic T2, some transglottic T3, some T4 (all cases in which the extension of the tumour or the general conditions of the patient advise against a more conservative treatment).

3 Surgical Technique: The incision of the skin preferred in total laryngectomy is André's incision, which involves the cutis, subcutaneous tissue, and the platysma muscle. The elevation of the myocutaneous flap with a suprafascial approach up to the lower edge of the mandible allows the ample exposure of the lateral and anterior regions of the neck (Fig. 14.46).

After drainage of the cervical lymph nodes, the subhyoid muscles are sectioned bilaterally at the bottom and rotated upwards, exposing the thyroid gland and the lower part of the larynx. The supramedial margins of the isthmus and lobes of the thyroid gland are elevated anteriorly and laterally from the cricoid (Fig. 14.47).

The greater cornu of the hyoid bone is freed laterally and then isolated with the scissors from their points of insertion in the ligaments, fascia, and muscles from the apex to the base; in performing this manoeuvre, the blades of the scissors must adhere to the bone to avoid damaging the lingual arteries, which lie immediately underneath. The hyoid bone is thus completely isolated laterally. Superiorly, the points of insertion in the suprahyoid muscles and the loose tissue beneath are sectioned, arriving at the submucosa of the glossoepiglottic valleculae (Fig. 14.48).

The superior laryngeal vasculonervous pedicle is isolated, ligated, and cut at the level of the thyrohyoid membrane on both sides (Fig. 14.49).

The larynx is now gripped and rotated laterally so as to expose the lateral margin of the thyroid cartilage, along which the inferior constrictor of the pharynx and the corresponding external perichondrium are sectioned; the inferior fibres of the constrictor going towards the cricoid are also sectioned (cricopharyngeus muscle) (Fig. 14.50).

With a separator, we then proceed to detach the anterior wall of the piriform sinus from the medial surface of the thyroid wings using an internal subperichondrial approach; this manoeuvre is also facilitated on both sides by the contralateral rotation of the larynx. Preserving the mucosa of the piriform sinuses, when this is made possible by the oncological situation, allows us to reduce the size of the pharyngostome resulting from the laryngectomy (Fig. 14.51).

We now section the full thickness of the anterior and lateral tracheal wall immediately above the first cartilaginous ring; the section at the same level of the rear tracheal wall, immediately under the lower margin of the cricoid lamina, must be performed taking care not to damage the anterior wall of the cervical oesophagus. During this incision, the inferior laryngeal pedicles are also cut, situated immediately

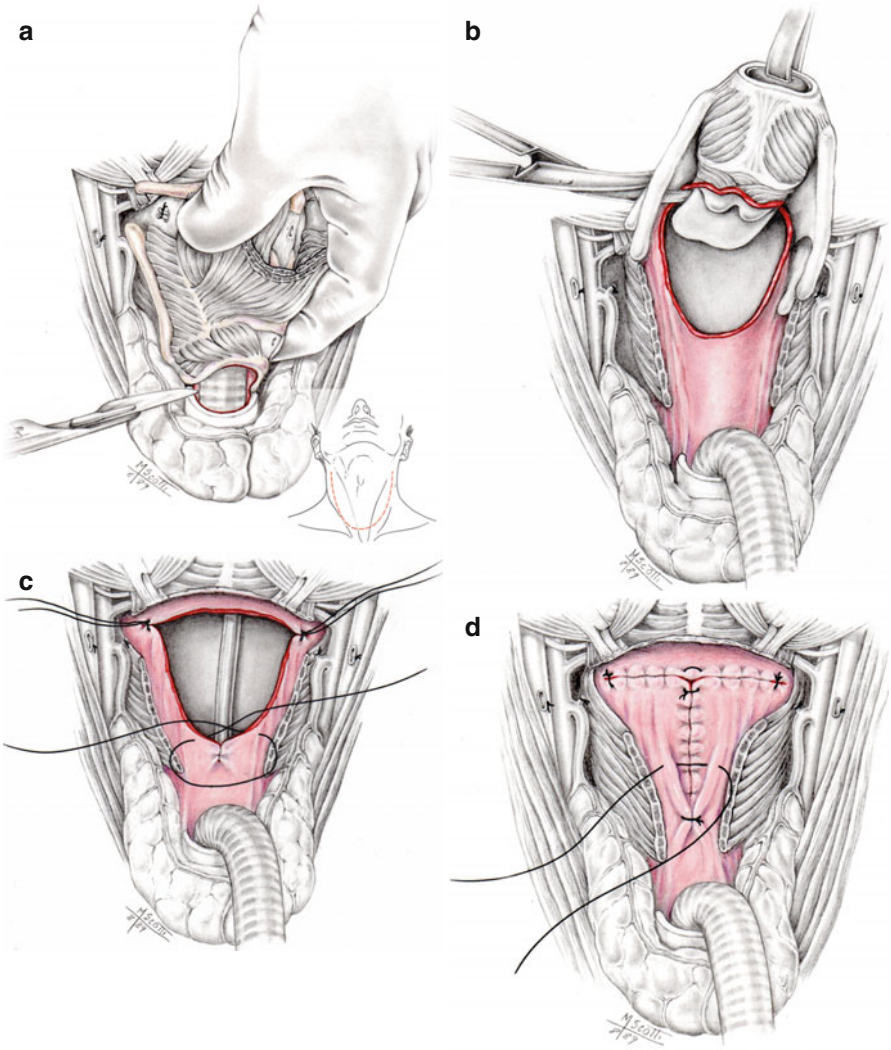


Fig. 14.45 Total Laryngectomy: surgical steps (**a**) (1) André's bilateral incision (if the neck dissections are performed) (2) section of subhyoid muscles at the base of the neck (3) resection of suprahyoid muscles along the superior edge of the hyoid bone (4) ligatures of superior vascular pedicles (5) section of the inferior constrictor muscle of hypopharynx and detaching of piriform sinuses from the thyroid lamina (6) caudal dissection above the first tracheal ring (**b**) detaching of larynx (rotated upwards) from hypopharynx preserving the piriform sinuses (**c**) (1) section passing through the valleculae mucosa and laryngectomy (2) T-shaped suture of the mucosal plane (**d**) (1) suture of the submucosal plane (2) suture of the muscles plane

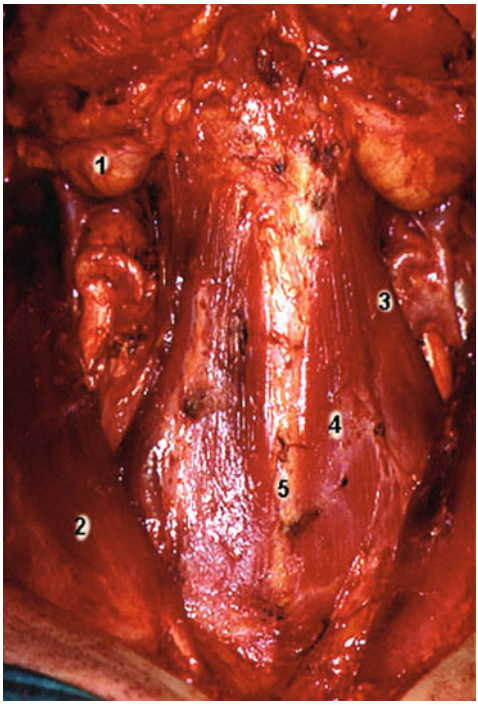


Fig. 14.46 *1* Submandibular gland, *2* sternocleidomastoid muscle, *3* omohyoid muscle, *4* sternohyoid muscle, *5* infrahyoid linea alba

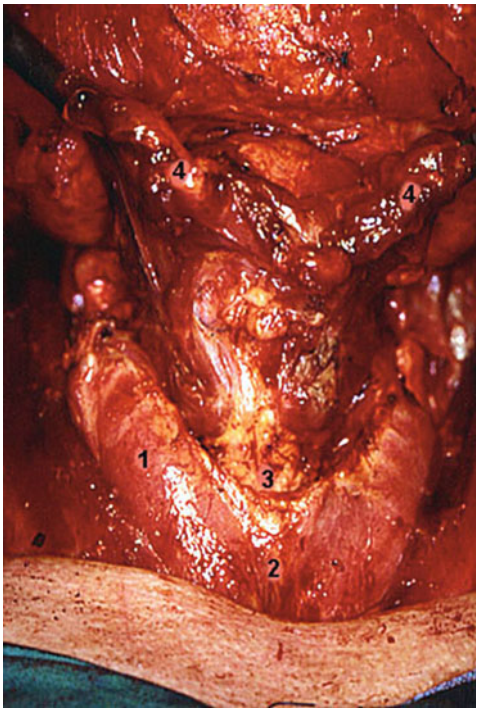


Fig. 14.47 *1* Right thyroid lobe, *2* thyroid isthmus, *3* cricoid cartilage, *4* subhyoid muscles (sectioned)

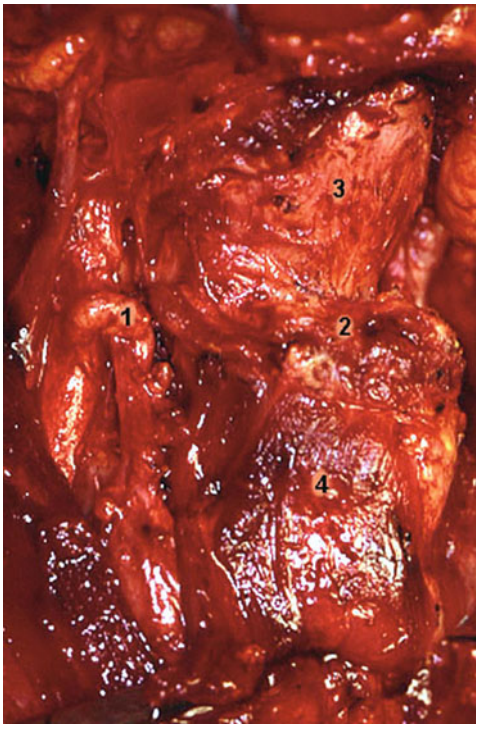


Fig. 14.48 *1* Superior thyroid artery, *2* hyoid bone, *3* preepiglottic space, *4* subhyoid muscles

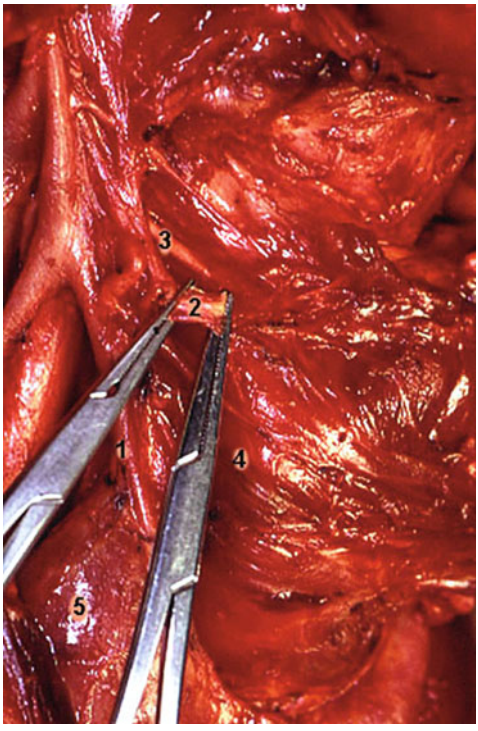


Fig. 14.49 *1* Superior thyroid artery, *2* superior laryngeal artery and vein, *3* superior laryngeal nerve, *4* inferior constrictor muscle of the pharynx

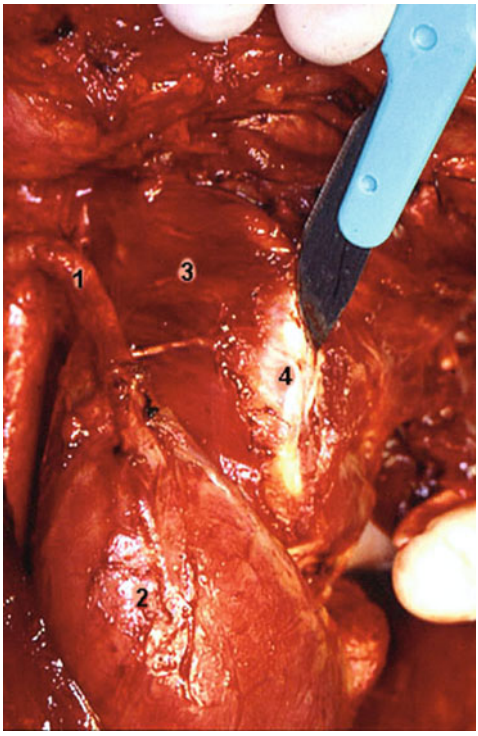


Fig. 14.50 *1* Superior thyroid artery, *2* right thyroid lobe, *3* inferior constrictor muscle of the pharynx, *4* thyroid cartilage

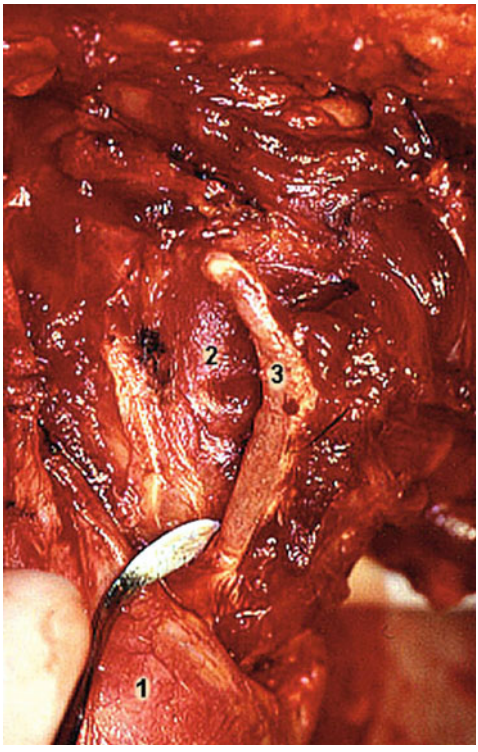


Fig. 14.51 *1* Right thyroid lobe, *2* right piriform sinus, *3* thyroid cartilage

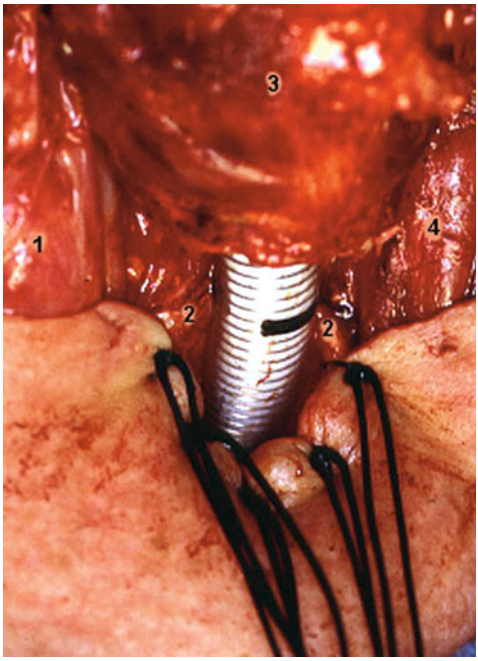


Fig. 14.52 *1* Right thyroid lobe, *2* tracheal ring, *3* larynx, *4* left thyroid lobe

lateral to the posterior ends of the first cartilaginous ring. The orotracheal anaesthesia tube is brought down and inserted in the opening in the trachea (Fig. 14.52).

The larynx is then rotated upwards, gradually detaching the anterior mucosa of the piriform sinuses and the retrocricoid mucosa inferosuperiorly with the scalpel from the posterior wall of the larynx as far as the base of the arytenoid cartilages (Fig. 14.53).

At this level, the mucosa is opened and sectioned along the contour of the laryngeal aditus (Fig. 14.54).

The complete detachment of the larynx is obtained by cutting the mucosa of the valleculae next to the tongue base with the scissors (Fig. 14.55).

We insert the naso-oesophageal feed tube. Two everted points of traction, fixed to the lateral ends of the inferior edge of the tongue base, cause the pharyngostome to assume a triangular shape with the base at the top (Fig. 14.56).

The pharyngostome is closed by means of a T-shaped suture of its edges, using interrupted and introflected stitches of fine absorbable thread, proceeding inferosuperiorly (Fig. 14.57).

Once vertical suturing of the mucosa has been completed inferosuperiorly and horizontal suturing latero-medially on both sides, a central everted "U" stitch completes the closure of the pharyngostome. A second suture, with everted interrupted stitches, is made on the outside of the previous one, through the submucosa. The closing of the pharyngostome must be carried out meticulously so as to ensure it is absolutely impermeable to the passage of saliva in the first days after the operation (Fig. 14.58).

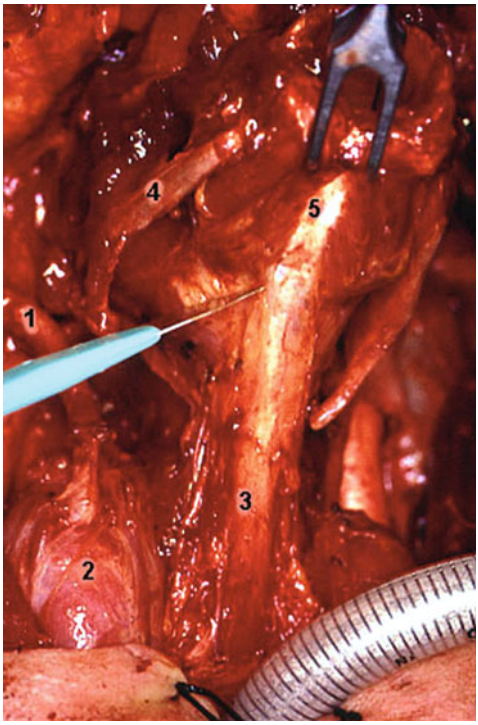


Fig. 14.53 *1* Superior thyroid artery, *2* right thyroid lobe, *3* hypopharynx, *4* thyroid cartilage, *5* cricoid cartilage

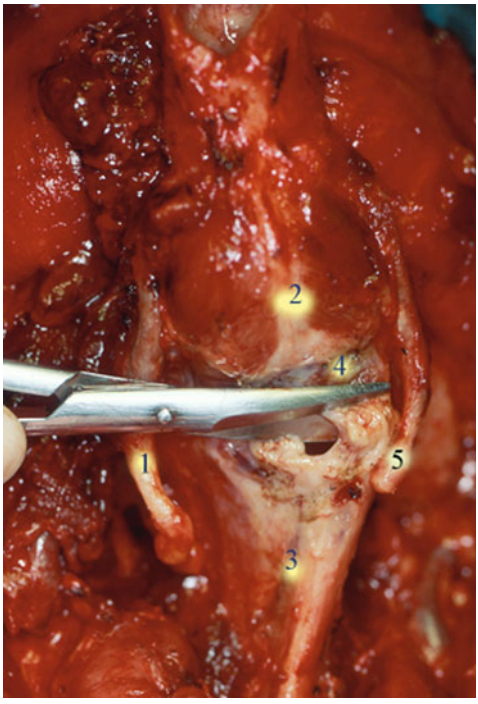


Fig. 14.54 *1* Right superior cornu of thyroid cartilage, *2* cricoid cartilage, *3* cervical oesophagus, *4* apex of left arytenoid cartilage, *5* right superior cornu of thyroid cartilage

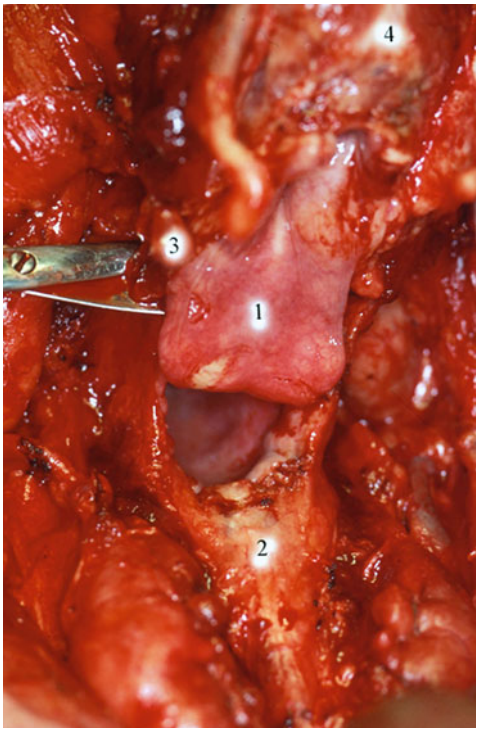


Fig. 14.55 *1* Suprahyoid epiglottis, *2* cervical oesophagus, *3* apex of right great hyoid cornu, *4* cricoid cartilage

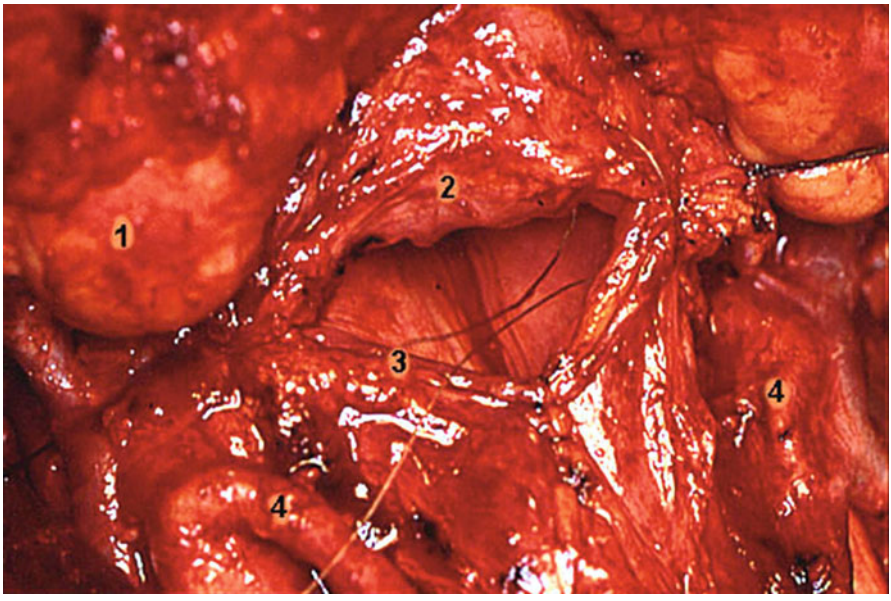


Fig. 14.56 *1* Submandibular gland, *2* tongue base, *3* hypopharyngeal mucosa, *4* superior thyroid artery

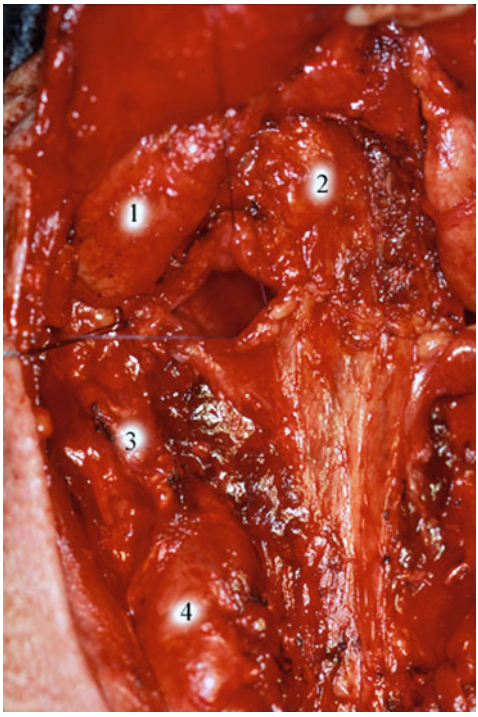


Fig. 14.57 *1* Right submandibular gland, *2* tongue base mucosa, *3* superior thyroid pedicle, *4* right thyroid lobe

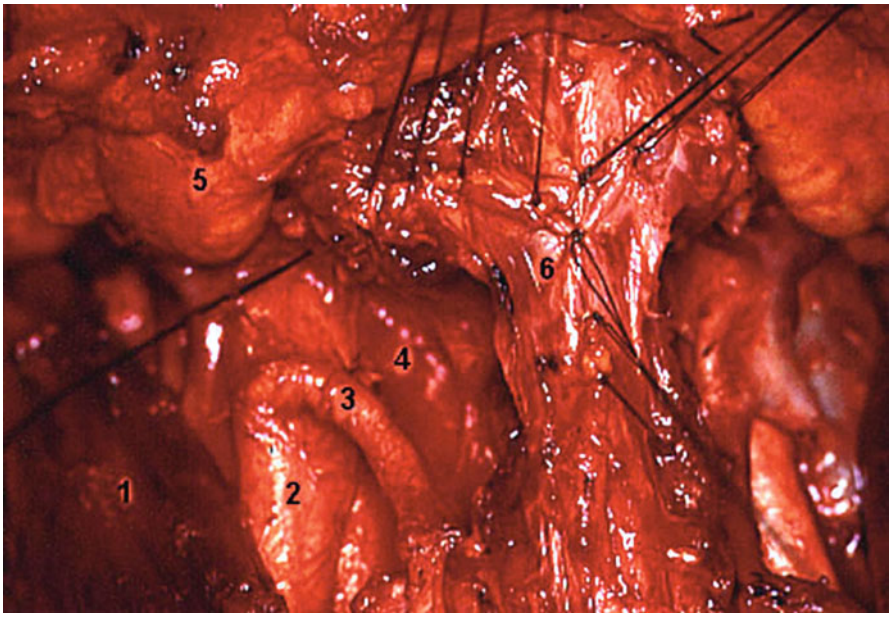


Fig. 14.58 *1* Sternocleidomastoid muscle, *2* external carotid artery, *3* superior thyroid artery, *4* inferior constrictor muscle of the pharynx, *5* submandibular gland, *6* hypopharyngeal submucosa

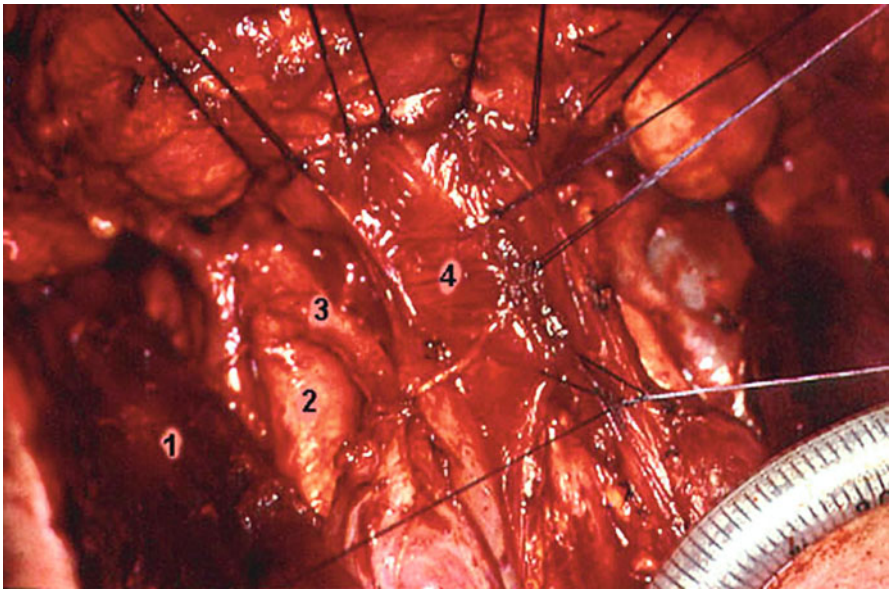


Fig. 14.59 *1* Sternocleidomastoid muscle, *2* external carotid artery, *3* superior thyroid artery, *4* inferior constrictor muscle of the pharynx

A third suture reconstitutes a muscle plane. The two section margins of the inferior constrictors, together with the two strips of perichondrium detached from the posterior edge of the thyroid cartilages and preserved in the demolitive phase of the operation, are sutured together vertically along the median line; the superior margin of the constrictors is horizontally sutured to the section edge of the suprahyoid muscles (Fig. 14.59).

The anastomosis of the tracheal opening to the cutis is obtained by suturing the anterolateral contour of the tracheostoma (corresponding to the cartilaginous ring) to the inferior cutaneous margin and the posterior edge of the tracheostoma to the cutaneous margin of the superior flap in the centre. The lateral traction exerted by the cutis on the two ends of the first tracheal ring helps keep the tracheostoma wide. The operation ends with the placement of suction drains and the suturing of the cutis on two levels.

14.6 Modified Radical Neck Dissection

Conceived in the early 1960s by Osvaldo Suarez [16, 17] in Montevideo, when from the early years of the century the standard treatment for cervical lymph node metastases had been radical dissection, it acquired its present importance and widespread use thanks to Ettore Bocca [18].

1 Principles of the Operation: (a) "En bloc" removal of the fasciae, the fatty tissue, and the cervical lymph nodes; (b) preservation of the sternocleidomastoid

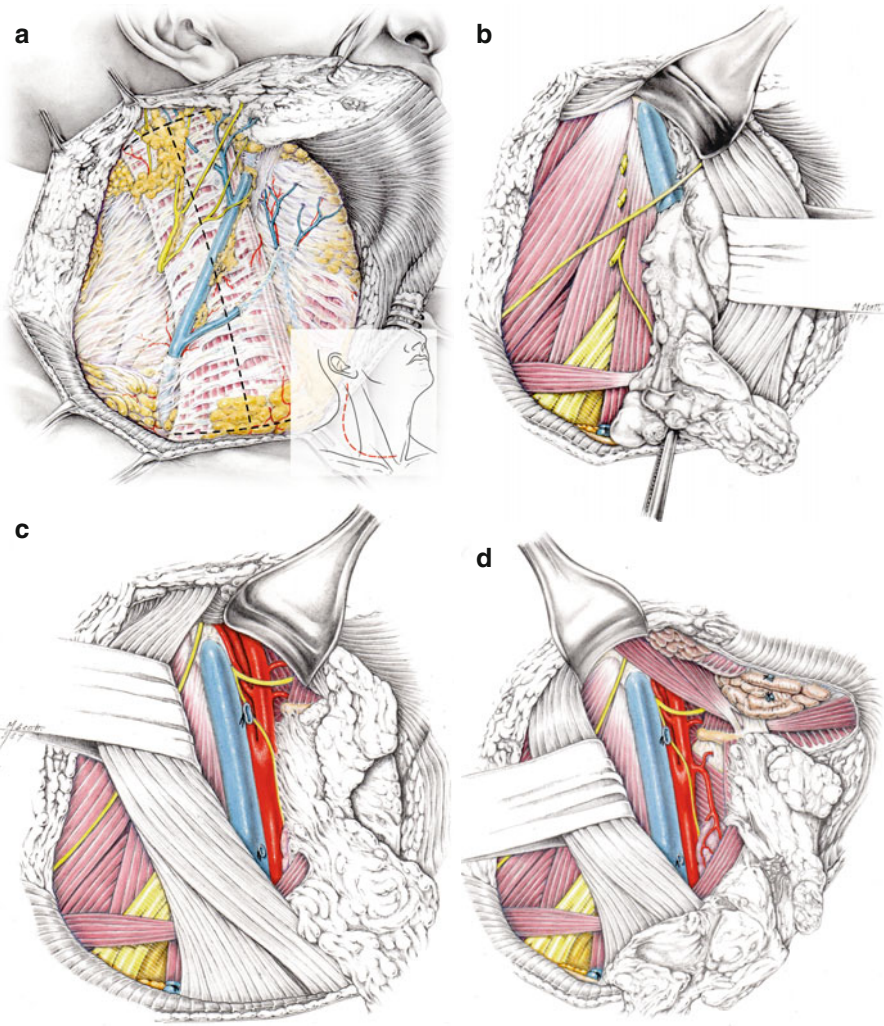


Fig. 14.60 Modified Radical Neck Dissection: surgical steps (**a**) (1) André's incision and detaching of platysma from the superficial cervical fascia (2) dissection of the superficial cervical fascia along the sternocleidomastoid muscle (**b**) dissection of supraclavicular space (VI Robbins level) spearing the spinal nerve, the phrenic nerve and the muscular portion of the cervical plexus (**c**) dissection of the jugulocarotid space (II–III–IV Robbins levels) spearing the internal jugular vein, the vagus nerve, the common trunk of spinal nerve and the hypoglossus nerve (**d**) the dissection arrives medially as far as the hyoid bone and the whole specimen must remain in continuity with the larynx

muscle, the internal jugular vein, and the spinal accessory nerve; (c) if the indications are correct, it has the same possibilities of regional control of the disease as radical dissection; (d) unlike radical dissection, it can be carried out simultaneously on both sides (Fig. 14.60a–d).

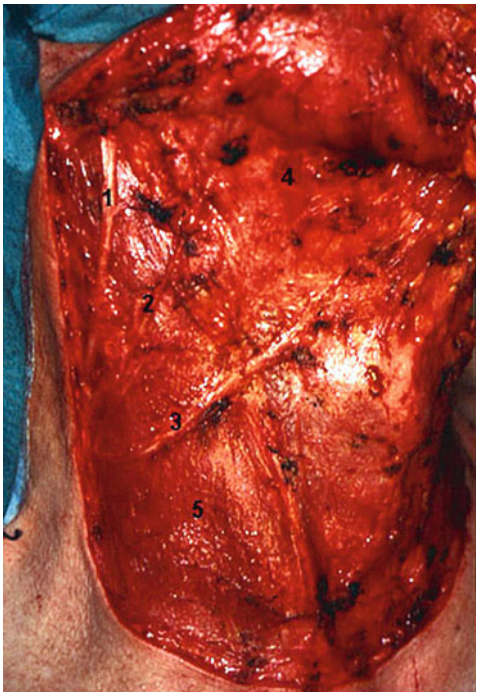


Fig. 14.61 *1* Great auricular nerve, *2* external jugular vein, *3* cutaneous cervical nerve, *4* submandibular gland, *5* sternocleidomastoid muscle

2 Indications: According to E. Bocca, all N in which there is no tumour outspread. It is contraindicated in patients with previous cervical radiation or results of lymphadenectomy, in which cases, the physiological lymphatic drainage routes are altered.

3 Surgical Technique: The preferred incision of the skin is André's incision (which is bilateral and symmetrical in the case of simultaneous bilateral dissection), involving the cutis, the subcutaneous tissue, and the platysma muscle.

The myocutaneous flap is elevated upwards from the superficial cervical fascia, as far as the inferior margin of the mandible at the back and the mental symphysis at the front; the rear flap as far as the anterior edge of the trapezius muscle; and the lower flap as far as the superior edge of the clavicle. In elevating the rear flap, care must be taken not to harm the peripheral branch of the spinal accessory nerve, the median section which lies very close to the subcutaneous tissue.

In this way, a large field of operation is obtained, traversed vertically in the centre by the sternocleidomastoid muscle, still covered by the superficial cervical fascia containing the system of the external jugular vein and some branches of the superficial cervical plexus (Fig. 14.61).

Dissection normally proceeds inferosuperiorly and posteroanteriorly. First, the anterior margin of the trapezius muscle is sought, then the peripheral branch of the spinal accessory nerve is identified and isolated, which we normally seek at its entrance into the trapezius muscle or where it comes out from the sternocleidomastoid muscle, about 1 cm above Erb's point (Fig. 14.62).

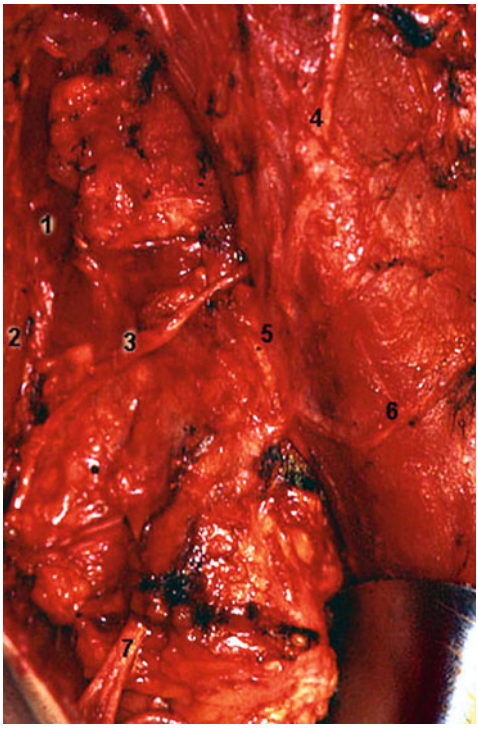


Fig. 14.62 *1* Levator scapulae muscle, *2* trapezius muscle, *3* spinal accessory nerve, *4* great auricular nerve, *5* Erb's point, *6* cutaneous cervical nerve, *7* cervical nerve for the trapezius muscle

Clearance of the fifth level does not normally include the resection of the muscular branches of the cervical plexus (Fig. 14.63); the phrenic nerve must be absolutely preserved.

The superficial cervical fascia is incised vertically along the anterior surface of the sternocleidomastoid muscle after ligation of the external jugular veins (Fig. 14.64).

The superficial cervical fascia is then elevated with the scalpel both on its external surface and on the internal surface of the sternocleidomastoid muscle, which is surrounded with a gauze swab and stretched anteriorly. At this point, removal of the fascial and fatty tissues of the supraclavicular fossa is begun latero-medially and inferosuperiorly, after ligation and section of the transverse pedicle of the neck and the branches for the trapezius muscle of the cervical plexus. A little lower down, the inferior belly of the omohyoid muscle is identified (Fig. 14.65).

The dissection of the supraclavicular fossa extends medially as far as the internal jugular vein, preserving the brachial plexus and the phrenic nerve and ligating and sectioning the external jugular vein. In the left side of the neck, it is necessary to recognise the thoracic duct and eventually interrupt it, after ligation.

Now we go back up. At this point, the retromandibular and external jugular veins are sectioned at the inferior pole of the parotid gland. A Farabeuf retractor pulls up the posterior belly of the digastric muscle and the stylohyoid muscle. Another retractor lateralises the sternocleidomastoid muscle. The upper landmark of dissection is the transverse process of the atlas, easily identifiable by palpation. The field of

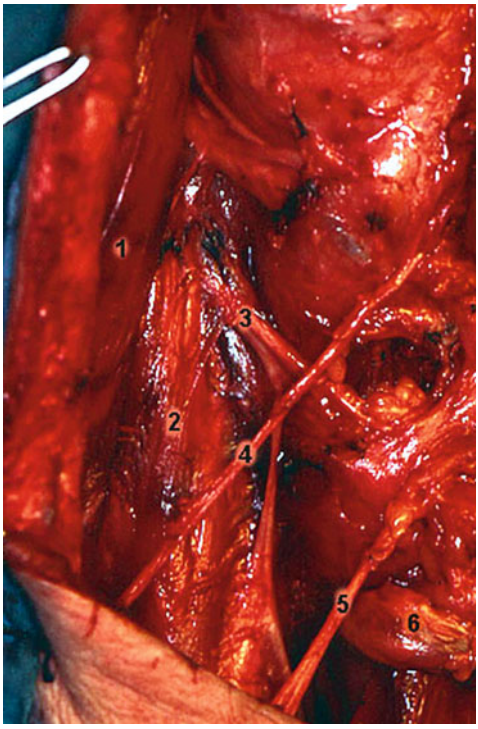


Fig. 14.63 *1* Trapezius muscle, *2* levator scapulae muscle, *3* branches of the cervical plexus, *4* spinal accessory nerve, *5* cervical branches for the trapezius muscle, *6* transverse pedicle of the neck

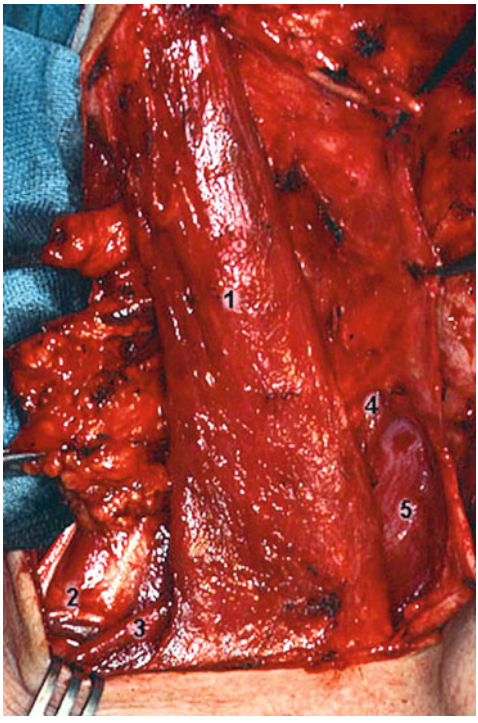


Fig. 14.64 *1* Sternocleidomastoid muscle, *2* traverse artery and vein of the neck, *3* inferior belly of the omohyoid muscle, *4* superior belly of the omohyoid muscle, *5* subhyoid muscles

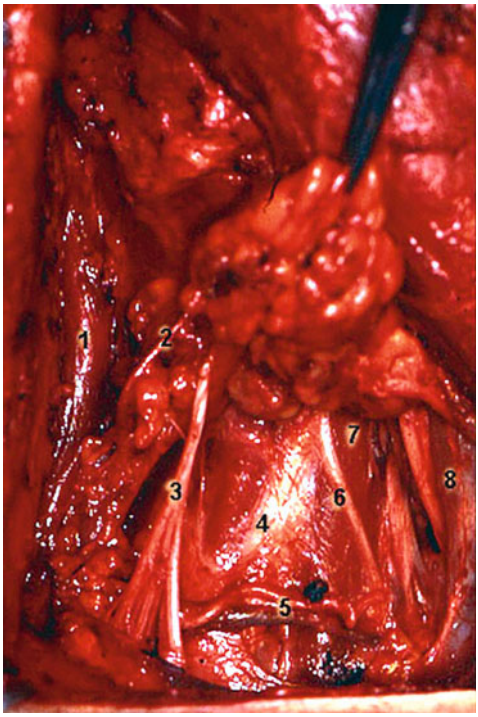


Fig. 14.65 *1* Trapezius muscle, *2* spinal accessory nerve, *3* cervical branch for the trapezius muscle, *4* brachial plexus, *5* traverse artery and vein of the neck, *6* phrenic nerve, *7* anterior scalene muscle, *8* internal jugular vein

operation is favourable for identification of the internal jugular vein with the spinal nerve that crosses it superficially (Fig. 14.66).

The loose tissue of level IIb is passed under the spinal nerve and rejoined to that of level IIa; this manoeuvre exposes the deep muscle plane, represented by the levator scapulae and splenius capitis muscles (Fig. 14.67).

We now go back down and proceed to complete dissection level III and IV in a latero-medial direction, taking the vagus nerve as reference (Fig. 14.68).

Also, the hypoglossal nerve and its descending branch are isolated from the fascial tissues (Fig. 14.69).

Using a subadventitial approach, the internal jugular vein is isolated (after ligation of the thyrolinguofacial trunk and of any other accessory branches) and then the carotid axis (Fig. 14.70).

Dissection is continued forwards in the parapharyngeal space, taking care to preserve the superior thyroid artery, and submandibular dissection, after ligation of the facial vein, preserving the salivary gland. During this surgical stage, it is necessary to preserve the marginal branch of the facial nerve, which must be identified beforehand and shifted cranially. Anterior clearance is completed as far as the median line with dissection of the submental region (interdigastric triangle) and of the superficial cervical fascia that covers the subhyoid muscles (Fig. 14.71).

Dissection is completed: all the lateral and anterior cavities, from the anterior edge of the trapezius muscle and from the splenius capitis muscle to the anterior median line in a horizontal direction and from the jugulodigastric space and from

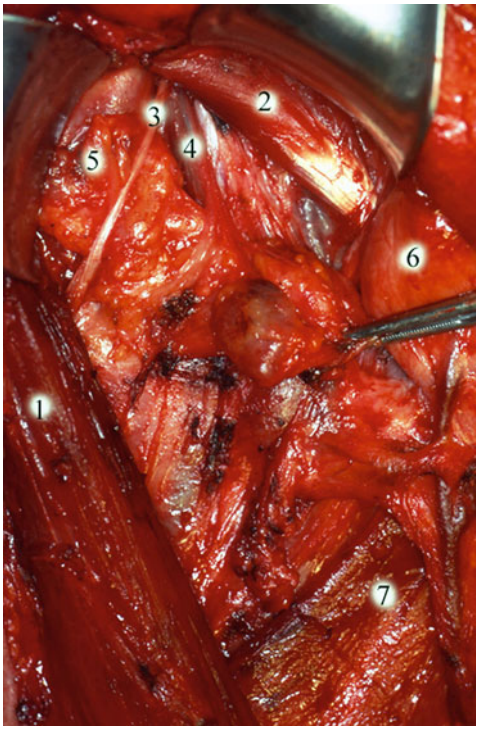


Fig. 14.66 *1* Sternocleidomastoid muscle, *2* posterior belly of the digastric muscle, *3* common trunk of the spinal accessory nerve, *4* internal jugular vein, *5* Robbins level IIB, *6* right submandibular gland, *7* omohyoid muscle

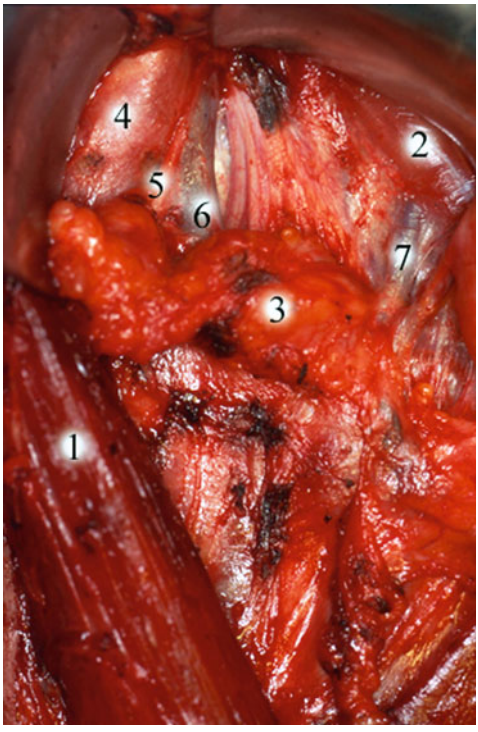


Fig. 14.67 *1* Sternocleidomastoid muscle, *2* posterior belly of the digastric muscle, *3* clearance specimen, *4* levator scapulae muscle, *5* common trunk of the spinal accessory nerve, *6* internal jugular vein, *7* lingual vein

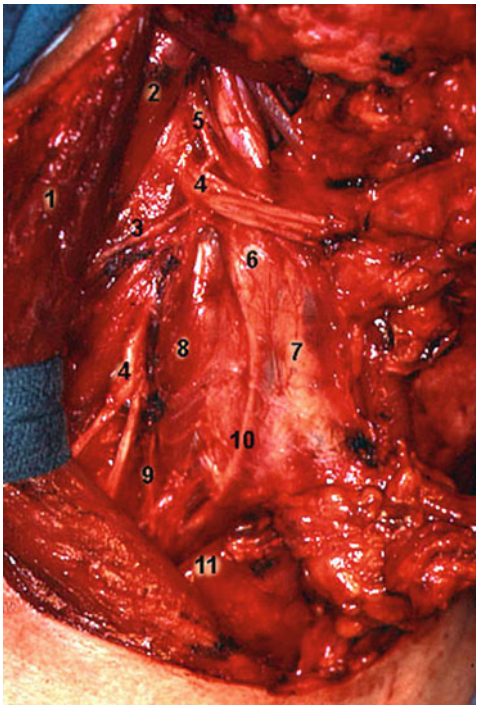


Fig. 14.68 *1* Sternocleidomastoid muscle, *2* levator scapulae muscle, *3* spinal accessory nerve, *4* cervical plexus, *5* hypoglossal nerve, *6* carotid bifurcation, *7* internal jugular vein, *8* anterior scalene muscle, *9* phrenic nerve, *10* descending branch of the hypoglossal nerve, *11* omohyoid muscle

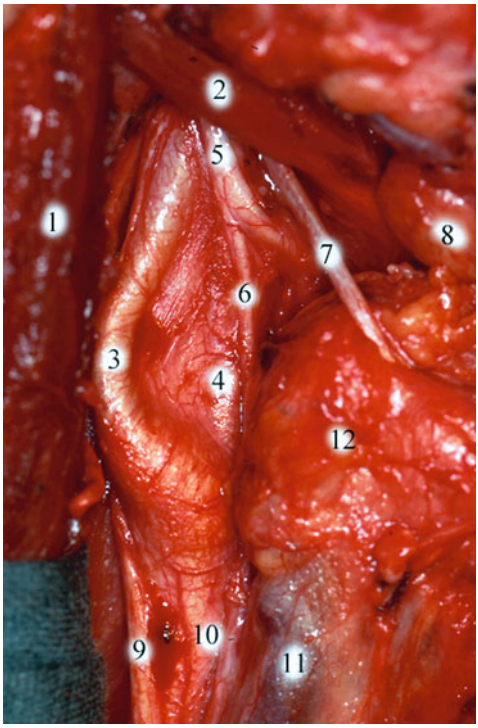


Fig. 14.69 *1* Sternocleidomastoid muscle, *2* posterior belly of the digastric muscle, *3* internal carotid artery, *4* external carotid artery, *5* hypoglossal nerve, *6* descending branch of the hypoglossal nerve, *7* lingual vein, *8* right submandibular gland, *9* vagus nerve, *10* common carotid artery, *11* internal jugular vein, *12* clearance specimen

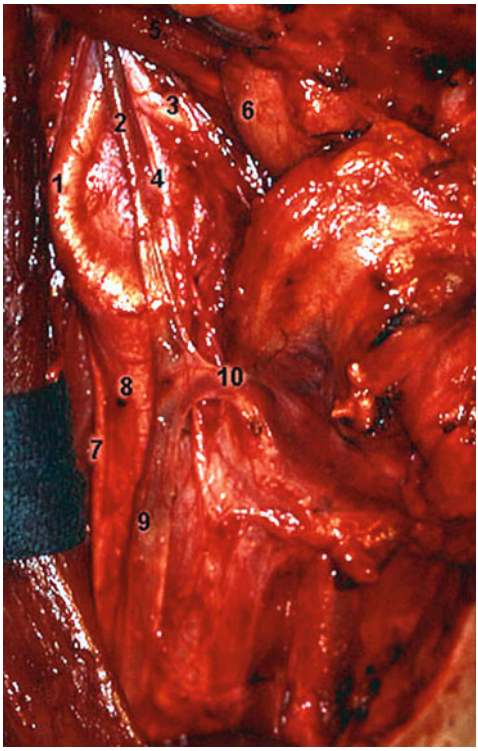


Fig. 14.70 *1* Internal carotid artery, *2* internal jugular vein, *3* hypoglossal nerve, *4* descending branch of the hypoglossal nerve, *5* digastric muscle, *6* submandibular gland, *7* vagus nerve, *8* common carotid artery, *10* thyrolinguofacial venous trunk

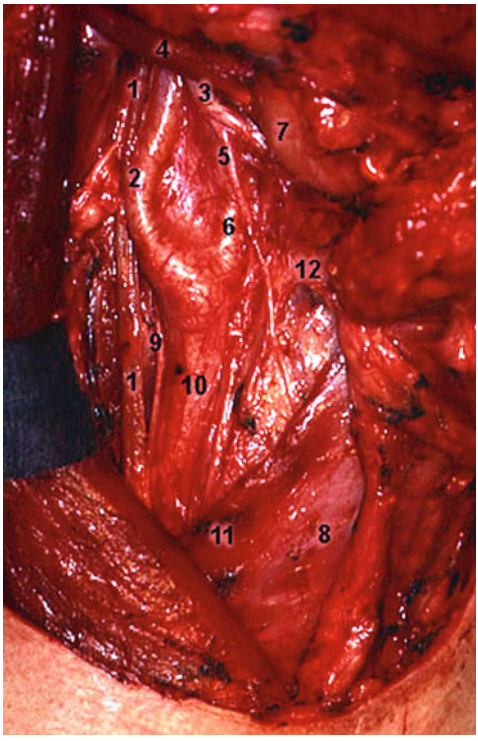


Fig. 14.71 *1* Internal jugular vein, *2* internal carotid artery, *3* hypoglossal nerve, *4* digastric muscle, *5* descending branch of the hypoglossal nerve, *6* external carotid artery, *7* submandibular gland, *8* sternohyoid muscle, *9* vagus nerve, *10* common carotid artery, *11* omohyoid muscle, *12* greater cornu of the hyoid bone

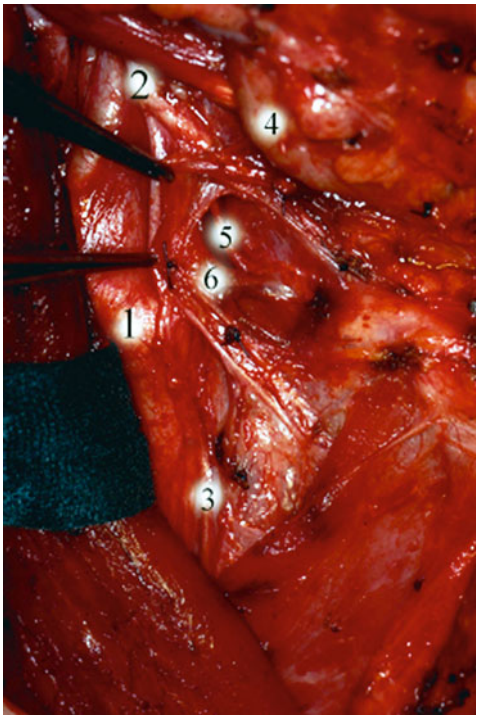


Fig. 14.72 *1* Carotid bifurcation, *2* hypoglossal nerve, *3* descending branch of the hypoglossal nerve, *4* submandibular gland, *5* superior laryngeal nerve, *6* superior laryngeal pedicle

the submandibular region to the superior margin of the clavicle in a vertical direction, must be radically cleared of the fasciae and of loose tissue. If the larynx is to be operated on immediately afterwards, at the end of dissection, the whole specimen must remain in continuity with the larynx, generally by means of the hyoid bone (Fig. 14.72).

4 Anatomical Variants: Those most observed are the following: (1) the peripheral branch of the spinal accessory nerve passes under the internal jugular instead of over it, or the same nerve runs completely outside the sternocleidomastoid muscle; (2) the branches of the internal jugular vein, sometimes also posterior, or the frequent presence of a median thyroid vain in addition to the thyrolinguofacial venous trunk; (3) the carotid bifurcation, which is usually at the level of the greater cornu of the hyoid bone, is much more caudal; and (4) kinking of the internal carotid artery just above the bifurcation (frequent) (Fig. 14.73) and carotid trifurcation (very rare) (Fig. 14.74).

Fig. 14.73 *1* Hypoglossal nerve, *2* common carotid artery, *3* internal carotid artery, *4* esternal carotid artery, *5* vagus nerve

Fig. 14.74 *1* Hypoglossal nerve, *2* common carotid artery, *3* esternal carotid artery, *4* internal carotid artery, *5* abnormal facial artery, *6* vagus nerve

Take-Home Messages

- Endoscopic laser surgery has introduced new and revolutionary concepts into ENT surgery, such as the concept of tailored surgery as apposed to the invariable choice of the procedure of the cervicotomic approach. It has drastically reduced postoperative morbidity, hospitalisation, and consequently the costs of the treatments.
- Learning surgical techniques requires an initial theoretical time of absorbing pure knowledge for everyone. After that, the possibility of putting what has been learnt into practice is linked to countless variables, only some of which can be controlled. However, it is always true that knowing is better than not knowing. And then, things can always change.

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