



# Direct Laryngoscopy a Prospective Study

Nabel Jabel Al Anzy

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## ***Contents***

Abstract	1
I. Chapter 1	2
1. Introduction	3
1.1. The Aims of the Study	3
1.2. Historical Review	3
1.3. Anatomy of the Larynx	3
1.4. Applied Physiology of the Larynx	4
1.5. Pathology	4
1.6. Conventional Direct Laryngoscopy	7
1.7. Micro Laryngoscopy	8
II. Chapter 2	9
1. Patients and Methods	10
III. Chapter 3	11
1. Results	12
IV. Chapter 4	16
1. Discussion	17
V. Chapter 5	19
1. Conclusion	20
2. References	20

## Abstract

A prospective analysis of 100 direct laryngoscopic procedures was performed in the department of otolaryngology -al imamain kadymain hospital- Baghdad –Iraq for the period from December 2013 to December 2014. The patients consisted of 55% males and 45 % females with an average age of 42.8 years. The most surgical indications for direct laryngoscopy in this study were hoarsness of voice (77%) and tumor -like masses on direct laryngoscopy (38%).

Most of procedures were performed under general anesthesia. Direct laryngoscopy was done as a diagnostic approach in 75 % of patients and in 25 % it was performed as a therapeutic procedure. Direct suspension microlaryngoscopy was further employed in 10 patients for therapeutic purposes. Laryngeal sequamous cell carcinoma was the most common final diagnosis among malignant cases (41%), where as chronic non-specific laryngitis was the predominant final benign diagnosis (13%), where as chronic non-specific laryngitis was performed was the predominant final benign diagnosis (13%).

The result revealed that the diagnostic accuracy of indirect mirror laryngoscopy compared with direct laryngoscopy was 61% moreover; the diagnostic accuracy was 87% by comparing direct laryngoscopy findings and histological diagnosis. Direct laryngoscopy was difficult in three patients. The difficulty was generally recognized in patients with short and muscular neck. The incidence of major complications was at least 4% with minor complications occurring in 7% of patients only. Moreover, laryngospasm was significantly higher among patients underwent direct laryngoscopy with other procedures "than those underwent direct laryngoscopy alone.

**Keywords:** Direct laryngoscopy; Oropharynx; Larynx; Supraglottic; Carcinomata; Endoscopy; Microlaryngoscoy

# Chapter I



## Introduction

**The Aim of the Study:** The aims of study are to evaluate the following points about direct laryngoscopy:-

- Indication of direct laryngoscopy.
- Age and sex distribution of pathologies diagnose by direct laryngoscopy.
- Correlation between indirect and direct laryngoscopic finding.
- Correlation between direct laryngoscopic findings histological diagnosis.
- Complications of direct laryngoscopy.

## Historical review

Manuel Garcia, a singing teacher of Spanish descent, French birth and English residence, viewed his own larynx in September 1854. He use a hand mirror both to reflect the sun rays to and receive his larynx' s image from a dental held in his oropharynx [1].

A note worthy historical case of laryngeal neoplasm was that of crown prince Frederick of Germany. It was in May, 1887, that morel Mackenzie requested that a fragment of the laryngeal growth be submitted for microscopic examination by Professor Virchow, the renowned pathologist [2]. On April 23<sup>rd</sup> 1895, in Berlin, Alfred Kirstein performed the first direct examination of the interior of the larynx. He named the combination of the electroscope and esophagoscope "autoscope" [3].

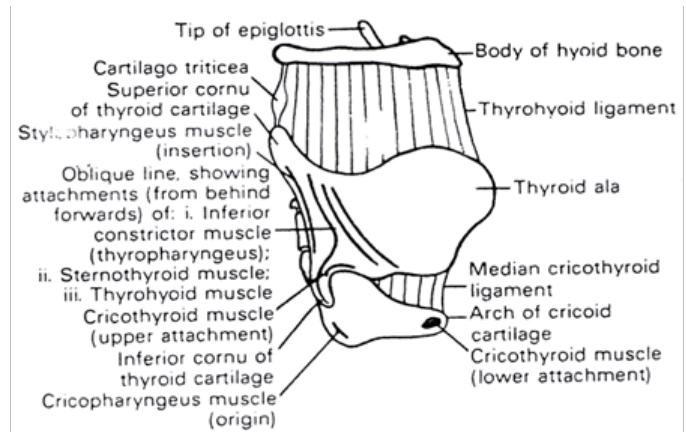
Introduction of suspension laryngoscopy by Killian, in 1909, marked a milestone s device in 1915 were required to make suspension laryngoscopy a practical procedure [4]. The cornerstone of microscopic laryngoscopy, however, was laid in the United States by scalo et al. in 1960. A year later kleinsasser described technique using a uniocular field glass type of prism and lens system [5]. Another milestone in the history of laryngoscopy was the introduction of the use of Zeiss binocular operating microscope to suspension laryngoscopy [4].

## Anatomy of the larynx (Figure 1 & 2)

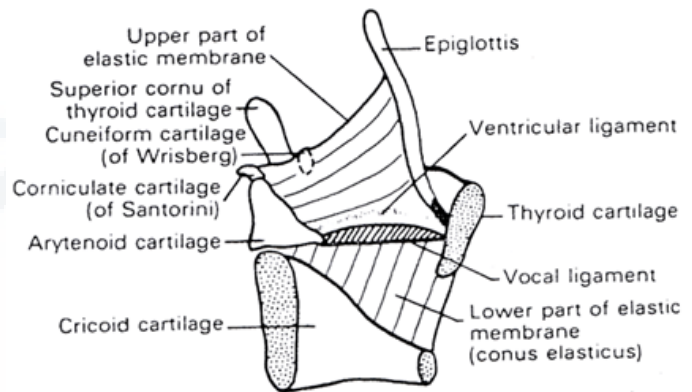
The larynx is situated at the midline of the neck at the meeting of the digestive and respiratory passages. It lies in front of the laryngopharynx from the level of the third to sixth cervical vertebrae. It consists of framework of cartilages, connected by ligaments and membranes, lined by mucous membrane and moved by muscles [6].

## Laryngeal cartilages

The epiglottis and the corniculate cartilages are composed of yellow elastic cartilage (which never calcifies). The remainder of the cartilages of the larynx is composed of hyaline cartilages (which in older age often calcifies and ossifies) [7]. The cartilages of the larynx are usually spoken of as paired and unpaired cartilages [8].



**Figure 1:** Cartilages of larynx and hyoid bone Lateral view.



**Figure 2:** Sagittal section of larynx to show intrinsic ligaments.

**Unpaired cartilages:** They are three cartilages

- Thyroid cartilages {the largest}: each half consists of: ala (lamina), superior cornu and inferior cornu.
- Cricoids cartilage: it resembles a signet. It consists of lamina and arch.
- Cartilage of epiglottis

**Paired cartilages:** They are three pairs of cartilages

- Arytenoids cartilages.
- Cornicuate cartilages; the cartilages of santorini.
- Cuneiform cartilages: the cartilages of wrisberg [6].

## Laryngeal ligaments and membranes

- Intrinsic:** uniting the cartilages of the one another. The elastic membrane of the larynx is divided into upper and lower parts by the ventricle of the larynx.
  - The upper part contributes to support of the aryepiglottic and ventricular folds.
  - The lower part is called the conus elasticus.
- Extrinsic:** uniting cartilages of the larynx to the skeletal structures outside the larynx. These are, thyroid membrane,, median thyrohyoid ligament, lateral thyrohyoid ligament, cricotrachea membrane and hyoepiglottic ligament [6].

**Mucous membrane of the larynx**

Reinkes layer of connective tissue is immediately under the epithelium of the larynx and superficial to the elastic layer. Stratified squamous epithelium is found over:

- a. Vocal cords.
- b. Upper parts of vestibule of the larynx.
- c. Ciliated columnar epithelium lines the reminder of the cavity

**Laryngeal muscles****I. Intrinsic**

1. Abductors of the vocal cords: posterior cricoarytenoid muscle.
2. Adductors of the vocal cords:
  - a. Lateral cricoarytenoid muscle.
  - b. Transverse portion of interarytenoid muscle.
  - c. External portion of thyroarytenoid muscle.
3. Tensors of the vocacords:
  - a. Cricoarytenoid muscle.
  - b. Internal portion of the thyroarytenoid muscle (vocalis).
4. Opener of the laryngeal inlet: thyroepiglottic muscle is a part of thyroarytenoid muscle.
5. Closers of the laryngeal inlet :
  - A. Oblique portion of the laryngeal inlet.
  - B. Aryepiglottic." Muscle

**II. Extrinsic**

- 1) "Strap" muscles of the neck: stern hyoid and thyrohyoid muscles.
- 2) Pharyngeal muscles: stylopharyngeus, palatopharyngeus and inferior constrictor muscles.

**Cavity of the larynx:** The cavity of the larynx is divided into three parts by two folds of mucus membrane, false vocal cords and true vocal cords. The mucosal folds divided the cavity into the following parts:

- a) Vestibule: lies between the inlet and the edges of the false cords.
- b) Ventricle: a recess between the false and true vocal cords.
- c) Subglottic space: lies between true vocal cords and the lower border of the cricoids cartilage [6].

**Blood supply of the larynx:** The region above the vocal cords is supplied and drained be the superior laryngeal artery and vien which enter the larynx through thyrohyoid membrane. The region below the cords is supplied and

drained by the inferior laryngeal artery and vein branches of the inferior thyroid artery [9].

**Nerve supply of the larynx:** Sensory nerve supply to the mucous membrane of the larynx above the vocal folds is from internal laryngeal nerve, a branch of the superior laryngeal branch of the vagus. Below the level of the vocal cords, the mucous membrane is supplied by the recurrent laryngeal nerve. The motor nerve supply to the internsic muscles of the larynx is the recurrent laryngeal nerve. Except for the cricothyroid muscle which is supplied by the external laryngeal nerve, a branch of the superior laryngeal branch of the vagus [10].

**Lymphatic drainage of the larynx:** The Supraglottic drains upwards via the superior laryngeal lymphatic pedicle which pierces the thyrohyoid membrane and ends in the upper deep cervical chain, the subglottis drains to both the prelaryngeal and paralaryngeal nodes and also directly to the lower deep cervical chain and the mediastinum [9].

**Applied physiology of the larynx****Functions of the larynx:**

- a) Protection of the lower air passages by closure of the larynx inlet, closure of the glottis, cessation of respiration and cough reflex.
- b) Phonation.
- c) Respiration: by reflex adjustment of the glottis aperture.
- d) Fixation of the chest.
- e) Laryngeal sphincters: by true vocal cords, false vocal cords and aryepiglottic sphincter [6].

**Movements of the vocal folds:** In quite respiration, the rima glottid is triangular in shape, with apex in front. With forced inspiration, the rima glottid is assumes a diamond shape due to the lateral rotation of the arytenoid cartilages [10]. Adduction of the vocal cords is essential for clear phonation, and anything which prevents this, results in dysphonia. The cords also adduct fully during coughing [9].

**Pathology**

**Cancer of the larynx:** Cancer of the larynx is a particularly important malignancy. It shares with only a few other types of cancer (such as the cervix, skin lymphoma, perhaps colon) a high rate of cure, which in certain group, may reach over 85%, and overall exceeds 50% [11].

**Macroscopic types**

- a. The papillary or exophytic carcinoma.
- b. The nodular types.

Both types usually ulcerate to form atypical carcinomatous ulcer [12].

**Histological types:** The vast majority of malignant tumours arising in the larynx are sequamous carcinomatous. All other types of malignancy arising in the larynx are rare [11].

**Spread of laryngeal carcinoma**

- I. Supraglottic carcinoma: invasion of the pre-epiglottic space is a prominent feature of supraglottic carcinoma. Supraglottic carcinoma may extend cranially to the valleculae and to the base of the tongue. Posteriorly the tumour may extend to arytenoid cartilage. The pyriform sinus can be involved by tumour riding over the aryepiglottic folds [11].
- II. Glottic carcinoma: forwards to the anterior commissure and backwards to the vocal process. Spread upwards into the ventricular band is late as in backward spread beyond the vocal process. Downward spread occurs into the sub-glottic space [6].
- III. Sub-glottic carcinoma:
  - a. Upwards to the edge.
  - b. Downwards to the trachea.
  - c. Circumferential spread [6].

**Lymphatic spread:** 44% of the patients with supraglottic carcinoma but only 5% of those with primary glottic carcinoma and 6% of those with subglottic carcinoma had palpable lymph nodes at the time of initial diagnosis [11]. Transglottic carcinoma carries high incidence (75%) of lymph node metastasis [9].

**Distant metastasis**

11% of patients present with distant metastasis at the time of the diagnosis, most of which occurred in the lung [11].

**Chronic non-specific laryngitis:** The term refers to a long standing diffuse inflammation involving predominantly the true vocal cords. This disorder may occur as a sequel to an episode of acute laryngitis, or may, as is often the case, develop insidiously. It appears that a combination of insult is responsible in the aetiology, producing a vicious cycle of events from which the laryngeal mucosa may fail to recover [13].

**Vocal cord nodules:** In children and adolescents the nodule consists of spindle – shaped thickenings of the edges of the vocal cords, whereas in adults they constitute more localized thickenings, varying from small points to nodules, typically at the junction of the anterior and middle thirds of the vocal cords and always symmetrically on both cords [14].

**Vocal fold oedema and laryngeal polyps:** Accumulation of fluid in Reinke's space is called vocal fold oedema; if the accumulation is concentrated at one point and balloons the epithelium out in front of it, this is known as a vocal fold polyp. Polyps can occur along the whole membrane part of the vocal folds, but are most common near the anterior commissure [14].

**Direct laryngoscopy**

Despite the recent increase in the use of flexible endoscopy, the place of rigid system endoscopy has not decreased,

perhaps with the exception of exclusion endoscopy [15].

**Indications**

- i. Diagnostic: Rigid system endoscopy is suitable for obtaining tissue for histological examination from patients with symptoms referable to the upper air and food passages.
- ii. Treatment: for a century now, rigid system endoscopy has been the method of choice for removing foreign bodies from the pharynx and larynx. Benign lesions such as polyps or nodules are readily removed endoscopically from the larynx. More recently, the laser has been employed in this manner.
- iii. As part of other procedures: an essential step in the treatment of a pharyngeal pouch is to pack it with ribbon gauze endoscopically to give bulk to the pouch and thus facilitate its location and dissection [15].

**Preoperative assessment**

- A. **Clinical examination:** A General medical history is taken and the patients' chest, heart and abdomen are examined. Clinical examination of the mouth, indirect laryngoscopy and palpation of the neck offers valuable information for assessment of each patient. Factors which may influence the endoscopy such as cracked or loose teeth, unusual configuration or stiffness of the jaw and neck should be noticed. The anaesthetist will wish to be warned of any suspected or significant narrowing of the airway.
- B. **Radiology:** x-ray of the chest and a lateral view of the neck are carried out.
- C. **General measures:** the patient is starved for a minimum of 4 hours and suitable premedication is ordered by the anaesthetist [15].

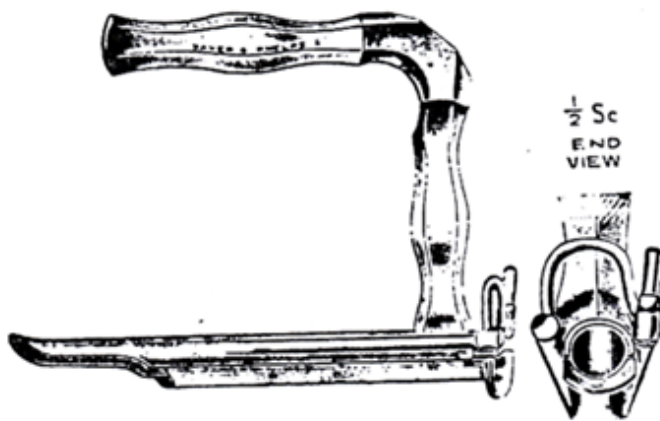
**Instruments (Figure 3-5)**

- a. The Jackson standard laryngoscope, allows panoramic view of the inferior oropharynx, the hypopharynx and the larynx [1]. It has a beak with a long cutaway and a removable section. This facility is needed only if a bronchoscope is passed via the instrument [16].
- b. The Hollinger anterior commissure laryngoscope, may be utilized to inspect the endolarynx and other areas that were not well seen with the wider instrument [1].
- c. Two fiberoptic light channels provide illumination from a single cable [16].

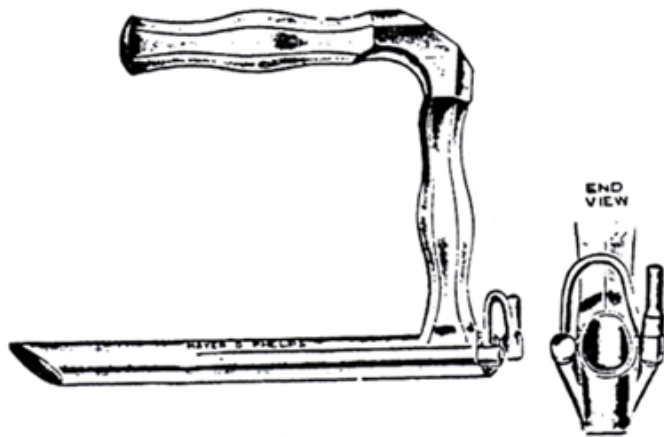
**Anaesthesia**

Local anaesthesia may be achieved by spraying the oropharynx with lignocaine (10%), pledgets of cotton wool soaked in cocaine (4%) are introduced into the pyriform fossae, and held in place for 3-4 minutes on each side. A spray of cocaine is then applied directly to the vocal cords using an angled spray [14].

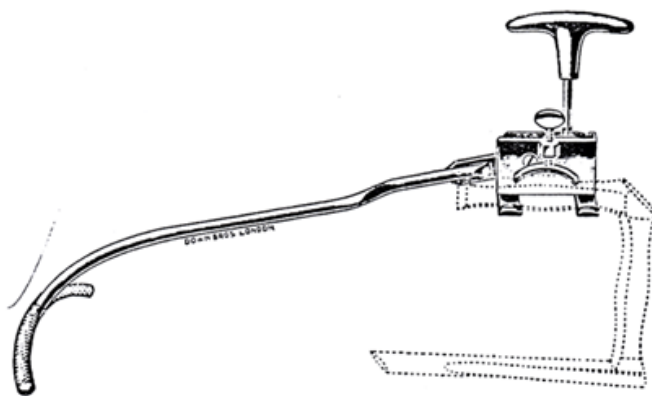




**Figure 3:** Negus laryngoscope with twin proximal illumination and panel to allow removal of instruments after insertion of bronchoscope, etc.



**Figure 4:** Negus laryngoscope anterior commissure with twin proximal illumination.



**Figure 5:** Lowy's Laryngoscope holder with chest support to aid easy and adequate exposure in laryngoscopy, leaving both hands free.

For all routine endoscopic surgery except augmentation of the paralyzed cords, the preferred technique is general anaesthesia with a small bore, cuffed endotracheal tube [13]. Many methods are possible using cuffed tubes, uncuffed tubes, and catheters entraining air by the venture

principle [16]. The cuffed endotracheal tube prevents the tracheobronchial tree from being inundated with secretions, blood or irrigating fluid and the front lens of the microscope from being fogged [18].

Atropine 0.4 mg by intramuscular injection will dry the pharynx and intravenous suxamethonium paralyses the larynx for examination. The patient must be ventilated artificially. Occasionally an obstruction such as tumor in the larynx makes intubation difficult and use of suxamethonium (scoline ) potentially fatal. In such cases, a tracheostomy after gas induction or local anaesthetic may be an essential preliminary to laryngoscopy [16].

All patients must have care full cardiac monitoring because of known tendency for suspension laryngoscopy to precipitate cardiac arrhythmias, especially in the patients with cardiac risk factors. Surface anaesthesia should be add at the time of intubation to reduce the incidence of post-extubation laryngospasm [13].

### Surgical technique

It's pointless to pretend that pan-endoscopy is a sterile technique. Indeed, covering up all but the patients mouth with green towels can be positively dangerous as important danger signs such as cyanosis or poor chest movements may be missed [15].

Positioning of the Patients and Insurting the Tooth Guard. The head should be well extend on the atlas and the neck flexed. It may be achieved very simply with a pillow placed partly under shoulders and partly under the head of a supine patient. As the gum or tooth guard is insurting the surgeon stretches the jaw and extends the atlanto-occipital joint [16].

### Passing the laryngoscope

The laryngoscope is lubricated and the sucker on. The surgeon stands and pushing down on the lower jaw with a free hand looks for the uvula, the first land mark. A second injection of paralysing agents may now be needed [16].

Meanwhile, the left hand is used to keep the lips everted, so that they don't get caught between the laryngoscope and teeth [13].

**Finding the larynx:** The beak of the laryngoscope is eased beneath the epiglottis and the instrument is lifted. Anaesthetic tubes should lie in the posterior part of the glottis between arytenoids cartilages [16].

**The Grip:** The instrument is introduced holding the inner handle. Once the organ is in view the grip changed so that considerable thrust may be exerted on the base of the tonque and mandible without leverage on the upper teeth [16].

**Viewing the larynx:** If a lesion is present, the surgeon should look everywhere else first before giving attention to it. Bleeding from contact or biopsy will could the view. Four areas of the larynx are regarded as "hidden" and

often requires the smaller anterior commissure scope. The subglottis, laryngeal ventricles, laryngeal surface of epiglottis and anterior commissure are the places which should receive special attention [16]. If the patient's configuration prevents a good view, an assistant can apply pressure externally on the larynx complex [15].

### Assessment of vocal cord movement

Anaesthetist should be informed so that the effect of muscle relaxant can wear off. A macintosh laryngoscope is inserted with the tip in the vallecula and the vocal cords are observed. This is more accurate than using the heavier laryngoscope behind the epiglottis as this may in itself cause distortion of the larynx and impairment of vocal cord movements [15].

### Post operative care

All patients who undergo direct laryngoscopy are most safely managed as an in-hospital setting for a period on the order of 24 hours [19]. If the patients show the signs of developing laryngospasm, the lower jaw should be subluxated anteriorly and then elevated [13].

Bleeding from biopsy site is rarely significant, but the anaesthetist will appreciate the surgeons help in placing the patients head down in the coma position. This is the moment to assess the air way and wheel the stridorous patient back into theatre for a tracheostomy.

Silence is advised for a few days where the operation has been performed to improve the voice [16].

It is important to write an accurate account of findings immediately.

In uncomplicated endoscopies, clear fluid are allowed when the patients is fully recovered from anaesthetic-usually 2-3 hours and , if tolerated well ,a light meal a further 2-3 hours later. However, where there has been any difficulty, particularly if there is a possibility of a perforation or tear in the mucosa nothing is given by mouth for 6-12 hours, while temperature, pulse and blood pressure are carefully monitored. Again, unless there has been any cause for concern during surgery or in the postoperative period, a routine postoperative chest x-ray is not obtained , although some surgeons still prefer to do so [15].

### Difficult direct laryngoscopy

With modern anaesthesia, the technique of direct laryngoscopy is usually an easy procedure. There are, a few patients in whom its examination is very difficult [20].

The following physical conditions may cause difficulties in direct laryngoscopy:

- a. Long incisor teeth
- b. Short lower jaw
- c. Short neck
- d. Heavy neck

- e. Marked obesity
- f. Cervical arthritis
- g. Prior surgery of cervical spine
- h. Improper position of the head [21]

### Complications of direct laryngoscopy

1. Contusions of the lips and tongue [13]
2. Missing teeth: if there is a possibility of a tooth ,or fragment of one , having been inhaled, then a chest x-ray must be obtained [15]
3. Perforation of the pharynx: If there is a possibility that it has occurred, the patient should be starved and observed carefully. A thoracic surgeon should be consulted. The perforation can be treated surgically or medically by intravenous fluids, with broad spectrum antibiotics; nothing should be allowed by mouth. Most perforations heal rapidly in this regimen, but it is wise to confirm this with a contrast swallow before letting the patient resume a normal diet [15].
4. Interference with the airway can be caused by compression or kinking of the endotracheal tube. During venture ventilation, great care must be taken not to change the alignment of the laryngoscope with larynx and trachea [13].
5. Acontineous watch must be kept for the development of cardiac arrhythmias. If they occur, the laryngoscope must be removed from the suspension and the patient hyperventilated with oxygen. Should the arrhythmia recur when the suspension is resumed, it is unwise to proceed with the operation [13].
6. Swelling of the laryngeal mucosa particularly in the sub-glottic area in children, must be avoided by gentleness of the manipulation at all times [13].
7. Suspension of the laryngoscope often causes slight cyanosis of the tongue, which is of no consequences [13].
8. Laryngospasm this is fairly common immediately after operation and is due to blood or other secretions in the larynx or irritation of the larynx by passage of endoscopes or tubes. Most anaesthetist prefer not to use local anaesthetic on the vocal cords and it is important that the patients cough reflex should recover immediately in view of the possibility of blood in the larynx or pharynx [ 5].
9. Intravenous suxamethonium, in a dose as small as 0.1 mg.kg-1, has been found to be reliable in the treatment of laryngeal spasm [22].

A simple manoeuvre which may prove helpful, other than the use of muscle relaxants, is oxygen inhalation and discontinuing the stimulus, to grasp the base of the tongue and pull forward thus stretching the hyo-epiglottic ligament and braking the ball valve effect [21].

**Microlaryngoscopy**

Microlaryngoscopy, as perfected by Kleinsasser, was an important advance in the diagnosis and treatment of laryngeal diseases [23].

**Advantages of microlaryngoscopy:** The laryngoscopes used in microlaryngoscopy have three particular features, namely, the matt black finish to prevent glare and reflection from the microscope, the broader lumen, and their ability to be stabilized allowing the operator both hands free for manipulation with larynx.

Other advantages stem from the magnification and excellent light provided by the microscope which, in turn, also allows more lucid teaching of students and trainees. Furthermore, accurate laser therapy is now available by linking an appropriate machine to the microscope [15].

**Disadvantages:** Compared to conventional laryngoscopy there are two main disadvantages. The first is the cost. The second is that procedures inevitably take very much longer, particularly if photography is undertaken [15].

**Indications for microlaryngoscopy:** The procedure particularly suited to microlaryngoscopy include laser excision of larynx lesions and microdissection, as in stripping of polypoid or premalignant vocal cords where it is necessary to grip mucosa with one instrument and dissect simultaneously with a second. In neonates or small infants magnification is often helpful [15].

**Instruments:** The following instruments are needed in addition to those described for conventional direct laryngoscopy:

- a. A standard operating microscope for precise examination and surgery of the larynx [13].
- b. A specially designed set of scopes and instruments for microlaryngoscopy has been produced by Kleinsasser who pioneered this technique [16].

c. Laryngoscope suspension and holder devices [13].

d. Suction tips (plain and insulated), cup forceps (upturned and straight), alligator forceps, scalpels, mirrors, sponge holder and caliper [13].

**Surgical technique:** Preparation and position of the patient are as for direct laryngoscopy with addition of a myo table or purpose built platform placed over the chest. A 400mm objective lens is required [16].

**Suspending the laryngoscope:** When the glottis is in view an assistant secures the holder to the laryngoscope handle and guides the long lever bar to the platform over the patients' chest. The surgeon turns the handle until, braced against the platform, the assembly becomes stable. Sometimes external pressure on the cricoid cartilage by an assistant is needed to bring the anterior larynx into view [16].

**The Microscope**

The 400mm objective lens is needed to permit working space for long instruments. A magnification of 10 X is usually adequate [16].

**Biopsy**

Differential staining with a nuclear stain, for example, toluidine blue, should always be done unless neoplasm has been confidently excluded from differential diagnosis. Biopsies taken from the stained area the most likely to demonstrate the malignant nature of a lesion if cancer is present on the surface.

If the lesion is large (5-10 or more), a biopsy can be taken with standard 2mm cup forceps. In the presence of small mass (less than 5 mm), excisional biopsy is indicated. The mass is grasped in cup forceps held in the hand opposite to the side of the lesion and the mass is excised with a scalpel or scissors that held in the other hand. Cystic lesions should be aspirated and decompressed prior to excision [13].

## Chapter II

## Patients and Methods

A prospective analysis of 100 direct laryngoscopic procedures was performed in the department of otolaryngology -al - Imamain Kadymain teaching hospital- Baghdad -Iraq for the period from December 2013 to December, 2015.

The charts of the patients were reviewed and data concerning age, sex, chief complaints, smoking, indirect laryngoscopic findings, complications, histological evaluation and final diagnosis were compiled.

The direct laryngoscopies were performed under general anaesthesia for most patients. However, only 3 procedures were done under local anaesthesia.

Direct laryngoscopy was done as a diagnostic approach in 75% of the patients and in 25% as a therapeutic procedure.

Endoscopic technique consisted of classical non suspension direct laryngoscopy using Hollinger anterior commissure and Jackson standard laryngoscopies. Direct suspension microlaryngoscopy was further employed in 10 out of 100 patients for therapeutic purposes.

Upper oesophagoscopy was performed on 7 patients, rigid bronchoscopy on 6 patients and further 3 patients required examination of the post nasal space.

The intraoperative and postoperative course of each patient was evaluated for documented complication. Furthermore, any complication of sufficient severity as to require hospitalization for adequate evaluation or treatment was designated as major. However, all other complications were considered as minor. The results obtained are arranged in form of tables and graphs using piegrams and histograms.



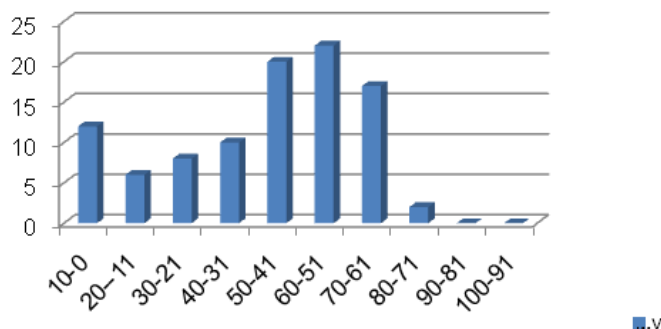
## Chapter III

## Results

The direct laryngoscopic procedures were performed for the first time on 82 patients out of 100. However, direct laryngoscopy was performed for the second time for the remaining 18 patients.

### Age and sex distribution

The average age of the patients at the time of the procedures was 42.8 years with a range of 45 days to 80 years. The peak age incidence was in the sixth decade (Figure 6). The study include 55 male patients (5%) and (45%) females.



**Figure 6:** Distribution of patients according to age.

### Indications for direct laryngoscopy

The surgical indications were found to be 16 in the retrospective analysis of data (Table 1). These were arbitrarily divided into three subdivisions namely clinical symptoms, clinical signs and miscellaneous.

**Table 1:** indications for direct laryngoscopy.

Indication	No. (%)
<b>Clinical Symptoms</b>	
Hoarseness of Voice	77(77%)
Stridor	33(33%)
Dysphagia	15(15%)
Laryngeal Pain	9 (9%)
Foreign Body Sensation	5 (5%)
Otalgia	5 (5%)
Haemoptysis	3 (3%)
<b>Clinical Signs</b>	
Tumor-Like Masses on 1/L*	38 (38%)
Immobile Vocal Cord	25 (25%)
Laryngeal Congestion	8 (8%)
Vocal Cord Nodule	7 (7%)
Vocal cord polyp	3 (3%)
Leukoplakia	1 (1%)
Cervical Lymphadenopathy	1 (1%)
<b>Miscellaneous</b>	
Difficult 1/L*	13 (13%)
S/P** Radiotherapy	10 (10%)

1/L: Indirect Laryngoscopy,\*\* s/p: Status Post.

The most frequent clinical symptoms were hoarseness (77%) where as tumor like masses on indirect laryngoscopy was the predominant clinical sign (38%).

### Final diagnosis

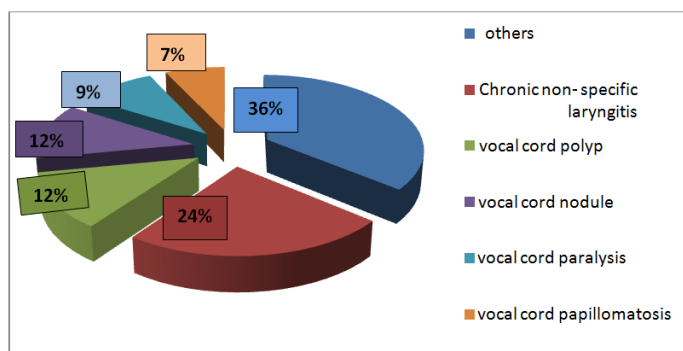
The final diagnosis collected were 24.these were analyzed regarding number of each lesion and sex distribution and listed in order of decreasing frequency (Table 2).

**Table 2:** The final Diagnosis.

Final Diagnosis	No.(%) of Patients	Male	Female
Laryngeal cancer	41(41%)	35	6
Chronic Non-Specific Laryngitis	13(13%)	6	7
Vocal Cord Polyp	7(7%)	2	5
Vocal Cord Nodule	7(7%)	1	6
Vocal Cord Paralysis	5(5%)	1	4
Recurrent respiratory Papillomatosis	4(4%)	3	1
Laryngomalasia	3(3%)	2	1
Hypopharyngeal Cancer	2(2%)	2	0
Sub-Glottic Stenosis	2(2%)	0	2
Croup	2(2%)	0	2
Orpharyngeal Cancer	1(1%)	1	0
Anaplastic Carcinoma Of Thyroid	1(1%)	1	0
Thymoma	1(1%)	0	1
Tuberculous Laryngitis	1(1%)	0	1
Tuberculous Cold Abscess of the Neck	1(1%)	0	1
Non-Specific Cervical Lymphadenopathy	1(1%)	0	1
Vocal Cord Granuloma	1(1%)	0	1
Vocal Cord Fibroma	1(1%)	0	1
Vocal Cord Carpillary Haemangioma	1(1%)	0	1
Laryngeal Web	1(1%)	0	1
Post-Irradiation Oedema	1(1%)	0	1
Functional Dysphonia	1(1%)	0	1
Psychogenic Stridor	1(1%)	0	1
Leukoplakia	1(1%)	0	1

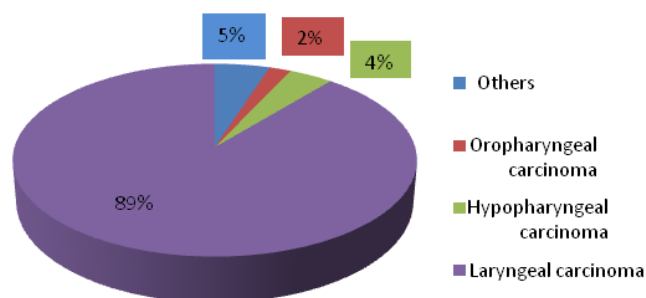
The final diagnosis was also divided into non-malignant and malignant lesions.

It was found that 54 % of the lesions were non-malignant. The most common non-malignant lesion (13/54-24%) was chronic non-specific laryngitis (Figure 7).



**Figure 7:** The percent of each non-malignant lesion.

The malignant lesions found to be 46%. The larynx was the most common site (41/46-89%), whereas the hypopharynx comprised 4% only (Figure 8). Moreover, patient with benign diagnosis were generally younger by an average of 26.8 years than those with malignant diagnosis. The majority of patients with benign lesions presented with one or two symptoms. In contrast, the patients with malignant lesions show more varied array and number of symptoms.



**Figure 8:** The percentage of each malignant lesion.

Furthermore, each indication was compared with the most frequently associated final diagnosis. Table 3 shows that 7 out of 16 indications were the most frequently associated with malignancy. These include: hoarseness, tremor-like masses on indirect laryngoscopy, stridor, immobile vocal cords, dysphagia, laryngeal pain and laryngeal congestion.

**Table 3:** Indication versus the most frequently associated final diagnosis.

Indication	Most Frequently Final Diagnosis
Hoarseness of Voice	Laryngeal cancer Chronic non-specific laryngitis
Tumous-Like Mass on Indirect Laryngoscopy	Laryngeal cancer Vocal cord poly
Stridor	Laryngeal cancer Laryngomalasia
Immobile Vocal cord	Laryngeal cancer Laryngomalasia
Dysphagia	Laryngeal cancer Hypopharyngeal cancer
Laryngeal Pain	Laryngeal cancer Chronic non-specific laryngitis

## Correlation between indirect and direct laryngoscopic findings

Overall, the diagnostic accuracy and examination success rate of indirect laryngoscopy. Versus direct laryngoscopy was 61% indirect laryngoscopic findings were judged to be equally accurate to those of direct laryngoscopy in 18 out of 25 patients having supraglottic lesions .therefore the diagnostic accuracy is 72% (Table 4).

**Table 4:** Comparison of accuracy of indirect laryngoscopy versus direct laryngoscopy in relation to the site of the lesion.

Region	No. of Patients	Accurate Indirect Laryngoscope	% of Accuracy
Supraglottis	25	18	72%
Glottis	36	22	61%
Subglottis	7	3	43%
Transglottis	6	2	33%
Pyriform Fossa	2	2	100%
Oropharynx	1	1	100%
Others	23	12	52%
Total	100	61	61%

The other group of patients having transglottic lesions, the diagnostic accuracy was 33% in 2 patients out of 6 (Table 4).

It can be concluded from Table [4] that the diagnostic accuracy of indirect laryngoscopy was the best for supraglottic lesions and less accurate for transglottic and sub-glottic lesions.

## Correlation between direct laryngoscopic findings and histological diagnosis

Histological examination was conducted on 62 specimens out of 100 direct laryngoscopic procedures. In 38 procedures, no biopsy was performed either the diagnosis was obvious on the basis of sole direct laryngoscopy or the procedure was carried out as a therapeutic measure.

Direct laryngoscopic findings and histological diagnosis were concordant in 87% b of the patients.

## Habits

The studied population was divided into tobacco smokers and non-smokers. The data indicated that 47% of the total group studied was tobacco smokers. The vast majority of patients with laryngoscopic evidence of malignancy (78%) were tobacco smokers. Interestingly, approximately 80% of patients with benign lesions were non-tobacco smokers.

## Difficult direct laryngoscopy

Direct laryngoscopy was difficult in 3 patients. (Table 5) describes such patients set by age, sex, diagnosis and suspected cause of difficulty. The difficulty was generally recognized in patients with short and muscular neck.

**Table 5:** Age, sex, diagnosis and suspected cause of difficulty in patients with difficult direct laryngoscopy.

Age	Sex	Diagnosis	Suspected Cause of Difficulty
50	Male	Laryngeal Cancer	Short Neck
			Short Lower Jaw
60	Male	Chronic Non-Specific Laryngitis	Short Neck
			Long Incisor Teeth
65	Male	Leukoplakia	Short Neck
			Marked Obesity

**Tracheostomy:** The patients conducted in this study show that 15 of them were previously tracheostomised, where as 7 of them required preoperative tracheostomies, either because of laryngospasm (3 patients )or as a preliminary to direct laryngoscopy.

### Complications of direct laryngoscopy

Complications were classified as major for untoward events that required hospitalization for proper management. Complications were otherwise considered minor. The overall complications of 100 direct laryngoscopic

procedures were 11%. They are divided into major and minor with percentages of 4% and 7% respectively. The most frequent major complication was strider requiring tracheostomy (3 patients). In an attempt to identify patients as risk, the major and minor complications were subdivided groups set by procedure performed, sex and diagnosis (Table 6). Furthermore, a group of patient referred to as the pure direct laryngoscopy group (PD/L) consists of 84 patients underwent direct laryngoscopy alone was studied separately. However, other procedures (including oesophagoscopy, bronchoscopy, tracheostomy, drainage of abscess) were performed concomitantly with direct laryngoscopy for the remaining 16 patients.

The results show that the subset of patients in (PD/L) group having experienced major or minor complication were 6, whereas the complimentary subset of patients with no complications were 78 (Table 6). It's found that the population in the (PD/L) group having experienced major or minor complication doesn't deviate significant from those in the total group with these complications. Similarly, there was no significant difference regarding the occurrence of major or minor complication when distribution by sex and diagnosis are considered.

**Table 6:** Complication of direct Laryngoscopy set by the procedure, sex and diagnosis.

Complication	No.	Procedure		Sex		Diagnosis	Benign
		PD/L	DL/+Other Procedures	Male	Female	Malignant	
Major							
Stridor → Tracheostomy	3	1	2	2	1	1	2
Perforation of Pharynx	1	1	0	1	0	0	1
Total	4	2	2	3	1	1	3
Minor							
Dysphagia	3	2	1	2	1	2	1
Sore Throat	2	2	0	1	1	1	1
Laryngospasm	2	0	2	1	1	1	1
Total	7	4	3	4	3	4	3
Overall Complications	11	6	5	7	4	5	6

However, when laryngospasm are considered separately, the results indicate that 5 patients developed it. Tracheostomy was performed for 3 of them. These were distributed as one patient in the (P/DL) group and 4 in the "direct laryngoscopy + other procedures" group with a percentage of 1.1% and 25% respectively. Statistical analysis shows that laryngospasm was significantly higher among patients underwent "direct laryngoscopy + other procedures" than those underwent direct laryngoscopy alone.

### Laryngeal cancer

The results revealed that 41 patient out of 100 were suffering from laryngeal cancer. It was found that 31 patients were newly diagnosed cancer cases, while the others were cases of recurrence following deep X-ray therapy.

**Distribution of Age and Sex Data:** The average age of the patients at the time of presentation was 57.2 years with arrange of 37 years to 80 years. Male patients were 36 out of 41 (85%) while females were 6(15%) with a ratio of 6: 1. Figure 9 shows that male involvement was more than females in all decades. The peak age incidence was in the seventh decade for males and in the sixth decade for females.

**Regions of the tumour:** The supraglottic region was more affected than other region. It comprised about 48.7%, where as the glottic was 29.2%, transglottic 14.6% and the subglottic comprised 7.5% only (Figure 10).

**Types of the tumour:** The most common cancer was squamous cell carcinoma (95.2%) one patient has

verrucous carcinoma (2.4%) and one has plasmacytoma (2.4%) Histological examination revealed that moderately differentiated squamous cell carcinoma was the most common type of squamous cell carcinomata (Figure 11).

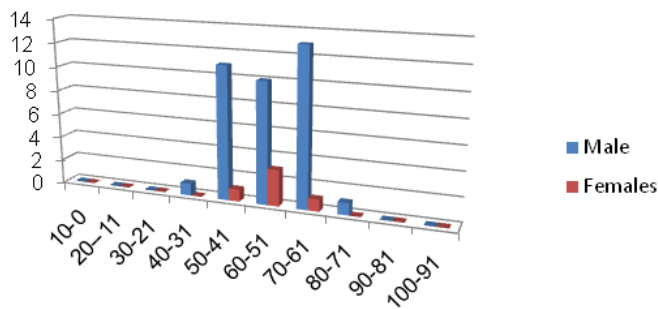


Figure 9: Age and sex distribution of patients with laryngeal cancer.

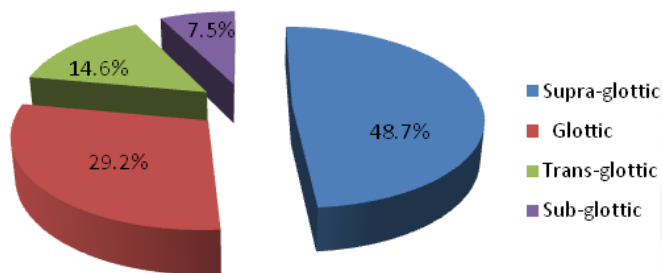


Figure 10: Region of the tumour in percentage.

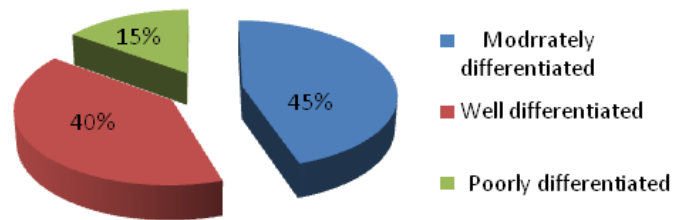


Figure 11: Degree of differentiation in Percentage.

**Chronic non-specific laryngitis:** Chronic non-specific Laryngitis was noticed in 13 patients out of 100 (6males and 7 females). Their average age was 37 years with arrange of 17-60 years.

**Vocal cord polyp:** Vocal cord polyp was diagnosed in 7 patients (2 males and 5 females) . Their average age was 41.2 years with arrange of 25-60 years. Most polyps' arised from the anterior third of the vocal cord. Moreover, a gigantic obstructing polyp was found in the subglottis.

**Vocal cord nodule (Singer's Nodule):** Vocal cord nodule was found in 7 patients (1 male and 6 female). Their average age was 27.2 years with arrange of 48 years. All nodules araised at the junction of anterior and middle third of the vocal cords. Vocal cord nodules were bilateral in 2 patients.



## Chapter IV

## Discussion

Direct laryngoscopy and Microlaryngoscopy offer better aids for the diagnosis and treatment of laryngeal disease. The technique is now reliable and can be used in clinics and in private practices since the procedure can be performed on an outpatient basis [23].

### Age and sex distribution

The average age of the patients studied was 42.8 years with arrange of 45 days to 80 years. The study includes 55% male patients and 45% patients were females, the peak age incidence was in the sixth decade.

In another study, Pashcow et al. [4], reported that the average age was 50.4 years with arrange between 4 years and 91 years. The male patients were 54% and 46% were females.

However, Al-Agilli [24], found that the average age of patients was 50.3 years with range between 2 years and 80 years. The peak age incidence for the patients studied was in the 7th decade for males and in the 5th for females consisting of 71% males and 29% females representively [24].

### Indications for direct laryngoscopy

In our study, the surgical indications were found to be 16. The most frequent clinical symptom was hoarseness (77%), where as tumour like-mass on indirect laryngoscopy was the predominant clinical sign with a percentage of 38%.

Moreover, Pashcow et al. [4], reported 30 surgical indications with hoarseness (83.6%) as the most frequent clinical symptom and vocal cord polyp (31.4%) as the predominant clinical sign. Our indication was more or less similar to the 21 surgical indications given by Al-Agilli [24].

Direct laryngoscopy was done as a diagnostic approach in 75% of our patients and in 25% as a therapeutic procedure. Pashcow at al. [4], reported that 66.9% of his patients underwent direct laryngoscopy was for diagnostic purposes.

### Anaesthesia

Generally, most of the procedures in our study were done under general anaesthesia (79%) and only 3 procedures performed under local anaesthesia. Patients [4] and Al-Agilli [4], used such anaesthesia in 97% [24]. In another reported, Lillie et al. [25]. Indicated that local anaesthesia being used predominantly in the United States. However, the overall trend over the past 25 years has been towards the use of general anaesthesia based on its convenience of use [4].

### Endoscopic technique

Endoscopic technique in our study consisted of classical non-suspension direct laryngoscopy. Moreover, direct suspension microlaryngoscopy was employed in 10 patients for therapeutic purposes. In contrast, Pashcow et al. [4], reported that 66.9% of his patients underwent direct laryngoscopy was for diagnostic purposes. However Al-Agilli [24], used direct suspension microlaryngoscopy in 27% of the patients.

## Final diagnosis

The final diagnosis collected were 24, these were divided into malignant a non-malignant lesions. The most frequent malignant diagnosis was laryngeal cancer (41%), whereas chronic non-specific laryngitis (13%) was the predominant benign diagnosis.

Similarly, Al-Mansouri [26], and Al-Agilli [24], reported that laryngeal cancer was the most frequent final diagnosis among patients underwent direct laryngoscopy accounting for 49% and 46% respectively [12]. However, Paschow et al. [4], in analyzing 280 consecutive direct laryngoscopic procedures reported that the most frequent lesion was vocal cord polyp (30.5%) and that laryngeal cancer comprised 12.5% only [4]. Moreover, Lehman et al. [23], reported that the 4 most frequent laryngeal pathologies were polyp, hyperplastic chronic laryngitis, Reinke's oedema and laryngeal cancer accounting for 76% of encountered pathologies.

It can be concluded from these data the low incidence of vocal cord polyps in our locality compared with other studies. Our study revealed a peculiar gigantic polyp in the sub-glottis which presented as obstruction of the airway. However, Gilman & Karmody [27] described 2 cases of gigantic laryngeal polyp both of which presented with total obstruction of the airway.

It must be remembered that although laryngeal polyp do not show malignant degeneration, indistinguishable from or concomitant with polypoid changes [27]. A young lady referred from the psychiatric department complaining from stridor was included in our study. Direct laryngoscopy revealed no pathology and was diagnosed as psychogenic stridor.

Skinner & Bradley [28], described 4 cases (all females) of laryngeal stridor of psychogenic origin, one case required tracheostomy [28]. In conclusion, these patients by manipulating their upper respiratory tract, and help from their social environment [28].

### Correlation between indirect and direct laryngoscopic findings

It can be concluded that the diagnostic accuracy and examination success rate of indirect laryngoscopy versus direct laryngoscopy was 61%. In comparison, Barker & Dort [29], reported that diagnostic accuracy of indirect laryngoscopy compared with direct laryngoscopy was 52% [24]. Moreover, the diagnostic accuracy was 64% according to Al-Agilli [24].

### Difficult direct laryngoscopy

With modern anaesthesia, the technique of direct laryngoscopy is usually an easy procedure. There are, however, a few patients in whom this examination is difficult [20]. Direct laryngoscopy was difficult in patients in our study. The difficulty was generally recognized in patients with short and muscular neck.

In comparison, White & Kander [20], reported that the

incidence of difficult direct laryngoscopy was one in every 65 adult patient. Our causes of difficulty were more or less similar to those reported by Lewy & Brusca [21].

### Complication

Complication was classified as major for untoward events that required hospitalization for proper management. Complications were otherwise considered minor. The incidence of major complications our study was 4%, with an incidence of 7% for minor complication. The most frequent major complication was stridor requiring tracheostomy.

In an attempt to identify patients at risk for complications, statistical analysis fails to show any statistically significant difference between distribution of patients according to sex, diagnosis or procedure performed for occurrence of major and minor complications.

In comparison, Hendrix et al. [19], reported that the incidence of major complications was at least 19.5% with minor complications occurring in 21% of patients. Statistical analysis does not offer reliable predictors of which patients are at risk for major and minor complications [19]. Moreover, Al-Agilli 1996, noticed that 1% of patients underwent direct laryngoscopy developed major complications (stridor requiring tracheostomy), whereas & patients developed minor complications [24].

Laryngospasm developed in 5 patients out of 100 underwent direct laryngoscopy in our study, 3 of them required tracheostomy. These were distributed as one patient in the pure direct laryngoscopy group and 4 in the "direct laryngoscopy + other procedures" group with percentages of 1.1% and 25% respectively. Statistical analysis shows that laryngospasm was significantly higher among patients underwent "direct laryngoscopy + other procedures" than those underwent direct laryngoscopy alone.

Hill et al. [30], found a 1.2% and 3% rate, respectively, of recovery room reintubation in patients who had undergone direct laryngoscopy alone or in conjugation with other endoscopic procedures. He concluded that the risk of post operative airway compromise was significantly greater among patients who had undergone direct laryngoscopy and pan-endoscopy than those who had general anaesthesia for other reasons [30]. Moreover, Al Agilli [24], had a 1% rate of emergency tracheostomy after direct laryngoscopy.

It is concluded that all patients who undergo direct laryngoscopy are most safely managed as an in -hospital setting for a period on the order of 24 hours [19].

### Laryngeal cancer

Laryngeal cancer was noticed in 41 patients out of 100 (41%). It was found that 31 patients (31%) were newly diagnosed cancer cases, whereas the others (10%) were cases of recurrence following deep X-ray therapy.

Similarly, Al-Agilli [24], reported that laryngeal cancer was newly diagnosed in 37% of the patients, whereas it was recurrent in 9%. Moreover Al-Mansouri [26], diagnosed laryngeal cancer in 49% of 140 patients underwent direct laryngoscopy. In contrast, Pachcow et al. [4], reported that 12.5% of 244 patients where newly diagnosed laryngeal cancer cases and it was recurrent in 1.5%.

**Age and sex Distribution:** It was found that the average age of the patients at the time of presentation was 57.2 years with range of 37 years -80years. The peak age incidence was in the 7th decade for males and in the 6th for females. The patients consist of 36 males (88%) and 6 patients were females (12%) with a ratio of 6:1. Similarly, Stell & Maran [31], reported that approximately 90% of laryngeal carcinoma occur in men, with a peak age incidence between 55 and 65 for reasons which are not fully explained, the disease is becoming commener in women and in the earlier years of life.

Moreover, Robin & Olofsson [11], reported that the one invariable characteristic of carcinoma of the larynx is it's greater predominance in men comparet with women 6:1 at its lowest in Canada and 32;1at its maximum in Italy. In another study, Al-Mansouri [26] reported that the peak age incidence was in the 6th decade for both sexes with a male to female ratio of 2.3:1 [26].

**Regions of the tumour:** Our study shows that the supra-glottic region was more affected than other regions. It comprised 48.7% whereas the glottis was 29.2%, trans-glottic 14.6% and the sub - glottic comprised 7.5% only. Similarly, Al-Agilli [32], reported that the supra-glottic region comprised 50.3 %. The glottis was 41.2% trans-glottic 6.6% and sub -glottic was 1.9%. However, Robin et al. [11], reported that laryngeal cancer is more often supra-glottic in Spain and Finland, whereas glottic tumours predominante in the U. K.

**Types of tumour:** The results show that 95.2% of laryngeal cancer was squamous cell carcinoma, 2.4 % was verrucous carcinoma and plasmacytoma comprised 2.4%. In contrast, Stell & Maran [31], reported that 85% of laryngeal cancer was squamous cell carcinoma, 3% verrucous carcinoma, 3% carcinoma in situ, 5% undifferentiated carcinoma, 0.5% adenocarcinoma, 1.5% miscellaneous carcinoma and 2% was sarcoma.

Moreover, Al-Agilli [32], reported that 97% of carcinoma, of larynx was squamous cell carcinoma, 1.8% was verrucous carcinoma, 0.6% adenoid cystic carcinoma and 0.6% was spindle cell carcinoma. We found that 40% of squamous cell carcinoma were well differentiated, 45% moderately differentiated and 15% were poorly differentiated. In contrast, Al-Agilli [32], reported that 10.9% were well differentiated, 68.4% moderately differentiated and 20.7% were poorly differentiated [33].

## Chapter V



## Conclusion

The average age of 100 patients underwent direct laryngoscopy was 42.8 years. The patients consisted of 55% males and 45% females. The most common surgical indication for direct laryngoscopy was hoarseness of voice and tumour-like masses on indirect laryngoscopy.

Laryngeal cancer was the most common malignant diagnosis, whereas chronic non-specific laryngitis was the predominant benign diagnosis. The diagnostic accuracy of indirect versus direct laryngoscopy was 61% and it was 87% by comparing direct laryngoscopic finding with histological diagnosis. Direct laryngoscopy was difficult in 3 patient. The difficult was generally recognized in patients with short and muscular neck.

The incidence of major complication was 4% with minor complications occurring in 7% of the patient. The most frequent major complication was stridor requiring tracheostomy. Moreover, laryngospasm was significantly higher among patients underwent "direct laryngoscopy+other procedures" than those underwent direct laryngoscopy alone.

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