

Original Research Article

Relevance of indirect laryngoscopy as an examination tool in present day otorhinolaryngological practice

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Received: 26 March 2020

Revised: 30 April 2020

Accepted: 01 May 2020

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ABSTRACT

Background: The objective of the study was to determine the difference in extent of laryngeal visualization between indirect laryngoscopy (IDL) mirror and rigid endoscopy (70°) and relevance of IDL in present day otolaryngological practice.

Methods: 100 patients attending to the Department of ENT, Vijayanagara Institute of Medical Sciences, Ballari, Karnataka with complaints referable to larynx and upper digestive tract were taken up for study. All patients underwent IDL mirror and rigid endoscopic (4 mm, 70°) examination. The extent of laryngeal visualization by the clinician was recorded for each examination.

Results: Out of 100 patients who underwent IDL mirror examination and rigid endoscopic (4 mm, 70°) examination in 87% of cases IDL mirror examination was adequate for making the diagnosis and in 11% of cases we needed rigid endoscopic examination for making the diagnosis. In 2% of cases we were not able to visualize the pathologies even with rigid endoscopy, in whom we needed other modalities of examination like radiological evidence to arrive at a diagnosis.

Conclusions: In the present study, in 87% of the cases IDL mirror examination was adequate for making the diagnosis. Eleven cases needed rigid endoscopic (4 mm, 70°) examination to aid in diagnosis of pathologies. Even though laryngeal mirror examination is less comfortable, causing gagging for patient and may provide less complete information when compared to rigid endoscopy because of its less expensive, better depth visualization of structures and near real size images provides a versatile tool till date. Be that as it may indirect laryngoscopic mirror examination remains the mainstay of otolaryngological practice in today's Otolaryngology practice.

Keywords: IDL mirror, Rigid endoscopy, Larynx

INTRODUCTION

The larynx is a complex organ, and it is anatomically comprised of several mucosal folds, elastic membranes, ligaments and muscles constructed on a cartilaginous framework. These structures can be involved in several disorders, and some of the regions can be quite challenging for assessment.

In 1806, Bozzini fashioned an angled speculum with a mirror insert for examination of various body cavities, including the larynx, using a single wax candle for illumination.^{1,2} In 1829, Babbington described a glottoscope, a three-bladed device including a stainless-steel mirror and tongue retractors.²

Desmoreaux, the 'father of endoscopy', redesigned Bozzini's endoscope in 1853 by attaching a gaslight and

condensers to project a beam of light down the tube; however, this was cumbersome and not widely accepted.²

In 1854, Manuel Garcia, a voice teacher preoccupied with the possibility of observing the movements of the vocal cords, noticed sunlight flashing on the window panes of a house and considered the idea of light from one mirror reflected to another. Using a dental mirror, a hand mirror, and sunlight, he was able to visualize his own larynx and vocal cords.²

Indirect laryngoscopy (IDL) examination with a mirror, a technique with an illustrious history, is used as a method of visualizing the larynx. IDL is the basic method to examine the larynx at the office. It traditionally entails use of head mirror and laryngeal mirror.³

Aside from evaluating dysphonia and as a routine mirror examination it is used in initial diagnostic step for difficulty in swallowing, neck swelling, suspicious of malignancy, vocal cord movements and before thyroid surgery. According to international data laryngeal lesions account for 1-2.5%.^{4,5}

Endoscopy has currently been an indispensable method in otolaryngology. Certain areas like anterior commissure, ventricle and subglottis are difficult to visualize. For this purpose, rigid endoscope has been introduced. 0°, 30°, 70° and 120° endoscope are available. In this study mirror and rigid endoscopy 70° was used for evaluation of larynx.

In this study we are determining whether there is difference in extent of laryngeal visualization between IDL mirror and rigid endoscopy (4 mm, 70°) and relevance of IDL in present otolaryngological practice.

METHODS

A total of 100 patients attending the Department of ENT, Vijayanagara Institute of Medical Sciences, Ballari, Karnataka, India were included for this study. Patients of both sexes included. This prospective study was carried out from December 2018 to December 2019. The study was approved by institutional ethical committee (No. VIMS/MED/STAFF-EC/48/2018-19). Informed written consent was taken from all the participating patients.

Inclusion criteria

Patients with complaints referable to larynx and upper aerodigestive tract like change in voice, difficulty swallowing, throat pain, difficulty breathing, burning sensation in throat, neck swelling and regurgitation were included in the study.

Exclusion criteria

Patient with stridor, acute respiratory distress, children below 12 years, patient with cervical spine pathology and with trismus or inability to open mouth.

Sample size was calculated using the below formula

$$\text{Sample Size} = \frac{Z\alpha^2 p(1-p)}{d^2}$$

$Z\alpha^2$ = Standard normal variate, 5% = 1.96

P = Expected proportion from population, 0.015%

d = Absolute error, 5%

Sample size = 23

We examined 100 patients and all underwent IDL mirror and rigid endoscopy (4 mm, 70°) examination. The extent of laryngeal visualization by the clinician was recorded for each examination. The list of structures seen included base of tongue, vallecula, glossoepiglottic fold (right, left and median), epiglottis (lingual surface, laryngeal surface and free margin) aryepiglottic fold, arytenoids, false vocal cord, ventricle, true vocal cord, vocal cord movements, anterior commissure, posterior commissure, pyriform fossa, post cricoid area and subglottis.

The larynx viewed at rest, during respiration, and during vocalization, noted details of symmetry, motion, surface architecture, evidence of inflammation, and abnormal masses or growths. Any abnormalities and involved sites were recorded. All patients were assessed by one author. The results were analyzed using simple statistical analysis like frequency, percentages, proportions and chi square test.

RESULTS

A prospective study was conducted on 100 patients attending the Department of Otorhinolaryngology with complaints referable to larynx and upper aerodigestive tract. Patients age ranged from 12 to 75 years. Mean age of the patient was 44.1 year. Maximum number of patients were in the age group of 51 to 60 years (23%) (Table 1).

Among the 100 patients, 70 patients (70%) were males and 30 patients (30%) were females. Among that 42% were males and 11% were females (Figure 1). Change of voice was the most common presenting complaint, in 53% of cases and difficulty swallowing in 46%, throat pain in 41%, burning sensation of throat in 24%, regurgitation in 20%, neck swelling in 13% and difficulty breathing in 3% of cases (Table 2).

Distribution of patients according to clinical diagnosis is given in Table 4. Gastroesophageal reflux disease 28%, supraglottic growth 12%, vocal cord nodule 11%, chronic pharyngitis 8%, vocal cord palsy 6%, dysphagia under evaluation 8%, glottic growth 5%, post radiotherapy carcinoma hypopharynx 5%, vocal cord polyp 4%, vocal cord papilloma 2%, anterior commissure polyp 2%, laryngopharyngeal reflux disease 2%, post thyroidectomy

vocal cord palsy 1%, transglottic growth 1%, tuberculosis of larynx 1%, dysphagia with pulmonary tuberculosis 1%, carcinoma tongue 1%, Reinke's edema 1% and cervical lymphadenitis 1%.

Table 1: Distribution of age group.

Age in year	Frequency (%)
10-20	9
21-30	20
31-40	17
41-50	14
51-60	23
>60	17

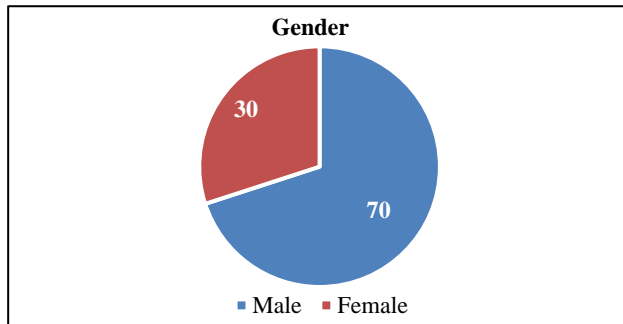


Figure 1: Distribution of patients according to gender.

Table 2: Distribution of patients according to presenting complaints.

Symptoms	Frequency (%)
Change in voice	53
Difficulty swallowing	46
Throat pain	41
Burning sensation of throat	24
Regurgitation	20
Neck swelling	13
Difficulty breathing	3

The base of tongue, vallecula, glossoepiglottic fold (right, left and median) lingual surface and free margin of epiglottis were visualized in 100 cases in both IDL mirror and rigid endoscopic examination (Table 3). Laryngeal surface of epiglottis was not visualized in 6 cases on IDL mirror examination and on endoscopic examination 2 cases were not visualized, abnormality noted in 1 case, and normal in 3 cases (Table 3).

Aryepiglottic fold was not visualized in 3 cases on mirror examination and on endoscopy 1 case was not visualized, 1 case was normal and in one case abnormality noted. Arytenoid was not visualized in 2 cases in mirror examination and on endoscopy 1 case not visualized and 1 case was normal (Table 3).

Table 3: Comparison of IDL mirror examination and rigid endoscopy.

Subsites	Clinical findings	IDL mirror		Rigid endoscopy (4 mm, 70°)		P value
		Right	Left	Right	Left	
Base of tongue	N	100	98	100	98	0.615
	A1	0	2	0	2	
	NV	0	0	0	0	
Vallecula	N	93	96	93	96	0.662
	A1	5	2	6	3	
	A2	1	1	1	1	
	NV	0	0	0	0	
Median glossoepiglottic fold,	N	96		96		1
	A1	4		4		
	NV	0		0		
Glossoepiglottic fold	N	95	97	95	97	1
	A1	4	2	4	2	
	A2	1	1	1	1	
	NV	0	0	0	0	
Lingual surface of epiglottis	N	86	87	86	87	1
	A1	7	6	7	6	
	A2	6	6	6	6	
	A6	1	1	1	1	
	NV	0	0	0	0	
Laryngeal surface of epiglottis	N	84	83	87	85	0.360
	A1	3	4	4	5	
	A2	7	7	7	7	
	NV	6	6	2	3	

Continued.

Subsites	Clinical findings	IDL mirror		Rigid endoscopy (4 mm, 70°)		P value
		Right	Left	Right	Left	
Free margin of epiglottis	N	88	87	88	87	1
	A1	5	6	5	6	
	A2	6	6	6	6	
	A6	1	1	1	1	
	NV	0	0	0	0	
Aryepiglottic fold	N	86	87	86	88	0.391
	A1	2	1	4	2	
	A2	9	9	9	9	
	NV	3	3	1	1	
Arytenoids	N	89	89	89	89	0.679
	A1	0	0	1	1	
	A2	9	9	9	9	
	NV	2	2	1	1	
False vocal folds	N	89	89	93	93	0.76
	A1	1	1	1	2	
	A2	0	0	4	3	
	NV	10	10	2	2	
Ventricle	N	0	0	90	91	0.00001
	A1	0	0	0	1	
	NV	100	100	10	8	
True vocal cords	N	71	76	73	78	0.96
	A1	4	1	5	3	
	A3	4	2	4	2	
	A4	10	10	11	11	
	A5	1	0	1	0	
	NV	10	10	6	6	
Vocal cord movements	0	70	72	71	70	0.404
	1	10	10	6	6	
	2	3	0	4	3	
	3	2	5	2	5	
	4	15	13	17	16	
Pyriform fossa	N	96	96	99	98	0.162
	A1	1	1	1	1	
	NV	3	3	0	1	
Anterior commissure	N	0	0	92	92	0.00001
	A3	0	0	2	2	
	A5	0	0	1	1	
	NV	0	0	5	5	
Posterior commissure,	N	91	91	96	96	0.151
	NV	9	9	4	4	
Post cricoid area,	N	88	88	88	88	1
	NV	12	12	12	12	
Subglottis	N	0	0	90	90	0.00001
	NV	100	100	10	10	

N-normal, NV-not visualized, A1-growth, A2-congestion, A3-polyp, A4-nodule, A5-papilloma, A6-ulcer, 0-mobile, 1-not visualized, 2-fixed vocal cord, 3-vocal cord palsy, 4-phonatory gap.

False vocal cords not visualized in 10 cases on mirror examination and on endoscopy 3 cases not visualized, 3 were normal and in 4 cases abnormality noted. True vocal cords were not visualized in 10 cases on mirror examination and on endoscopy 5 cases were not visualized, 2 cases were normal and 3 cases abnormality noted. Vocal cord movements not visualized in 10 cases

on mirror examination and on endoscopy 6 cases were not visualized 1 case was normal and 3 cases abnormality noted (Table 3).

Pyriform fossa not visualized in 3 cases on mirror examination and on endoscopy 1 case not visualized, 1 case was normal and 1 case abnormality noted. Posterior

commissure was not visualized in 9 cases on mirror examination and on endoscopy 4 cases were not visualized and 5 cases were normal. Post cricoid area was not visualized in 12 cases on IDL mirror examination and endoscopic examination (Table 3).

Anterior commissure, ventricle and subglottic area not visualized in 100 cases on mirror examination. On endoscopy abnormality noted in anterior commissure in 3 cases, in ventricle 1 case and no abnormality noted in subglottic (Table 3).

Table 4: Distribution of patients based on clinical diagnosis.

Clinical diagnosis	Frequency
Gastroesophageal reflux disease	28
Supraglottic growth	12
Vocal cord nodule	11
Chronic pharyngitis	8
Vocal cord palsy	6
Dysphagia under evaluation	8
Glottic growth	5
Post radiotherapy carcinoma hypopharynx	5
Vocal cord polyp	4
Vocal cord papilloma	2
Anterior commissure polyp	2
Laryngopharyngeal reflux disease	2
Post thyroidectomy vocal cord palsy	1
Transglottic growth	1
Tuberculosis of larynx	1
Dysphagia with pulmonary tuberculosis	1
Carcinoma tongue	1
Reinke's edema	1
Cervical lymphadenitis	1
Total	100

In 87% of cases IDL mirror examination was adequate for making the diagnosis. In 11% of cases we needed rigid endoscopy to aid in diagnosis of pathogenesis and 2% cases were not visualized even in rigid endoscopy needed radiological investigation for diagnosis. On applying Chi-square test significant correlation was found between the IDL mirror and rigid endoscopic examination in ventricle, anterior commissure and subglottic area.

DISCUSSION

Out of 100 patients attending the department of ENT who underwent IDL mirror examination and rigid endoscopic examination (4 mm, 70°), age ranged from 12-75 years with mean age of 44.1 year. Majority of patients fell in age group 51-60 years (23%). Herrington-Hall et al stated

that taking the variable of age into account, it is clear that laryngeal pathologies occur most frequently in the older age group because carcinoma and vocal fold paralysis being the most commonly found cause of vocal dysfunction in the elderly.⁶

Male to female ratio in our study is 2.3:1 with males 70% and females 30%. Male to female ratio in Baitha et al, Mehta, Parikh, Deshmukh with 2:1, 1.8:1, 2:1 and 1.5:1 respectively.⁷⁻¹⁰

In our study, hoarseness of voice is the commonest presenting complaint in 53%. In the literature available to us, incidence of hoarseness among patients attending ENT OPD could not be found. This problem has been encountered by some other workers also like Mehta (1985) who has mentioned that a search of available literature on laryngology for the comparative incidence of causes of hoarseness of voice was unfruitful Parikh (1991) also comments - "It's strange that hoarseness as a subject has not attracted the attention of many workers".

In our study, in 87% of the cases IDL mirror examination was adequate for making the diagnosis. In 11% of cases we needed rigid endoscopy to aid in diagnosis of pathogenesis. On applying Chi-square test significant correlation was found between the IDL mirror and rigid endoscopic examination in ventricle, anterior commissure and subglottic area.

In our study IDL mirror examination in critical zones, anterior commissure, ventricles and subglottis was not visualized in 100% of cases whereas in Eryilmaz et al study showed sensitivity of 20-25% in these areas.¹¹ In our study 70° degree endoscopy in critical zones, anterior commissure visualized in 95%, ventricles 90% and subglottis 90% of cases. Eryilmaz et al stated that 70° endoscopy superior with 70-100% sensitivity and for anterior commissure and ventricle 100% and subglottis 70-90% sensitivity, which is in line with our study.¹¹ Literature search revealed only handful of articles published which were in line with our study.

IDL mirror examination is the first and most basic successful technique for viewing larynx and arguably remains the most commonly used diagnostic method for laryngoscopy. Significant advantages of IDL mirror include widespread availability in all ENT departments, low cost to buy and maintain and a learning curve that is not insurmountable and it provides glare-free lighting of laryngeal structures, allowing observation of subtle color variations.

IDL mirror examination method has limitations including perceptual errors, difficulties in the user reliably recording the side of lesion, the learning curve in acquiring and maintaining the skillset, Limitations include anatomic variations, such as a large tongue, micrognathia, and trismus, that preclude adequate examination and the inability of the patient to speak in a normal manner because of the requisite positioning.¹²⁻¹⁴

It is a procedure free of complications except for gagging and failure to visualize the lesion, which occurs more frequently than with flexible or direct laryngoscopy.^{15,16} Failure of IDL suggests that microlaryngoscopy may be difficult.¹⁷

Endoscopic assessment, either with a rigid or flexible laryngoscope, has supplanted mirrors due to better optical resolution and higher sensitivity. The rigid Hopkins rod system uses 70° or 90° angled lenses and allows an excellent view of the larynx through a transoral approach.

The following advantages can be attributed to 70° endoscopy: evaluation of the lesion margins with a wider angle, better illumination, increased magnification and superior depth of field and overcoming the difficulty of vision resulting from the bulkiness of the lesion. The disadvantages being its expensive, few sites are difficult to visualize and conical view.

Along with technological progress, office examination has evolved, including rigid endoscopy (70°, 90°), fibroscopy and stroboscopy with video recordings.¹⁸ Certain regions of the larynx such as the anterior commissure, ventricles and subglottic area are still difficult to visualize.

The high-technology imaging techniques computed tomography (CT) and magnetic resonance imaging (MRI) also can be helpful in the assessment of these areas obscured beyond the mucosal folds. Routine mirror examination of the larynx adequately provides a reliable diagnosis in most patients. But in some it is not adequate and here rigid or flexible endoscopy will be a good alternative. The rigid endoscopy adds further diagnostic information in those patients who cannot be evaluated with mirror.

CONCLUSION

In the present study, in 87% of the cases IDL mirror examination was adequate for making the diagnosis. Eleven cases needed Rigid endoscopic (4 mm, 70°) examination to aid in diagnosis of pathologies. Even though laryngeal mirror examination is less comfortable, causing gagging for patient, needs longer learning curve and may provide less complete information when compared to rigid endoscopy, because of its less expensive, better depth visualization of structures and near real size images provides a versatile tool till date. Be that as it may indirect laryngoscopic mirror examination remains the mainstay of otolaryngological practice in today's otolaryngology practice.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kishore HR, Hosakoti P. Relevance of indirect laryngoscopy as an examination tool in present day otorhinolaryngological practice. *Int J Otorhinolaryngol Head Neck Surg* 2020;6:1125-31.