

Clinicopathological study of vocal cord paralysis

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Abstract

Introduction: Phonation is beyond doubt one of the highest functions of the human larynx. The function of vocal cords is to produce sound varying only in pitch and intensity. This is then modified by resonating chambers above and below the larynx and is ultimately converted into phonemes by the articulating action of pharynx, tongue, palate, teeth and lips. Vocal cord paralysis can be primary or it may be due to secondary to direct infiltration of the vocal cord, larynx or laryngeal muscles. **Aims and objectives:** This study designs to determine the incidence, age, involved sides, causes and position of vocal cords in patients of vocal cord paralysis. **Material and Methods:** This study was carried out at Department of ENT, Government medical college, Jammu for a period of 1 year i.e. from May 2014 to May 2015. This study includes a detailed history and complete physical examination with relevant investigations in 46 cases of vocal cord paralysis. **Results:** Majority of our patients were above 40 years of age, with maximum number of patients in the age group of 61 – 70 years. There was no significant sex difference, with a male to female ratio of 1: 1. The most common presenting symptom was hoarseness alone. Left vocal cord involvement was seen in majority of patients with the right vocal cord involvement predominantly seen in patients undergoing thyroidectomy. Unilateral vocal cord paralysis was much more common than the bilateral. The most common cause of vocal cord paralysis was neoplasm, with bronchogenic and esophageal carcinomas being commonest. **Conclusion:** Neoplasms were found to be the most common cause of vocal cord paralysis and thyroidectomy was found to be one of the leading iatrogenic cause of vocal cord paralysis. Thus by avoiding injury to recurrent laryngeal nerve, most of the traumatic vocal cord paralyses can be prevented.

Keywords: Hoarseness, larynx.

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Received Date: 20/06/2016 Revised Date: 24/07/2016 Accepted Date: 12/08/2016

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	DOI: 16 August 2016

INTRODUCTION

Phonation is beyond doubt one of the highest functions of the human larynx. It is evolved not only for the verbal communicative faculty of speech and language but also for certain non-verbally communicated messages e.g; a baby crying to attract the attention of its mother, changes in the tone of voice to express an attitude such as intimacy, submission or dominance towards the person to

whom the message is directed and so on. The vocal cord is a multilayered vibrato. Vocal cords are defined as two folds which extend from the middle of the angle of thyroid cartilage to the vocal process of arytenoid cartilages. Vocal cords are lengthened by cricothyroid muscle.^[1] True vocal cord paralysis signifies loss of active movement of the vocal cords, secondary to the disruption of the motor innervations of the larynx. It should be differentiated from fixation of the vocal cord secondary to direct infiltration of the vocal cord, larynx or laryngeal muscles. It should be distinguished from fixation at the crico-arytenoid joint, encountered with rheumatoid arthritis or following traumatic intubation.^[2] Vocal cord paralysis must be regarded as a sign of underlying disease, not simply a diagnostic unto itself. Diagnosis of underlying etiology involves localization of a lesion of vagus nerve or its branches anywhere from the cerebral cortex to the neuro-muscular junction or at the crico-arytenoid joint. Several studies point to extra laryngeal malignancy as the leading etiology of vocal

cord immobility whereas other surgical causes may be replacing thyroidectomy as the leading cause of surgical trauma.³ Recurrent laryngeal nerve supplies motor innervation to all the intrinsic laryngeal musculature, with the exception of cricothyroid muscle. Injury to recurrent laryngeal nerve results in vocal cord paralysis. Because of its longer course, left recurrent laryngeal nerve is paralyzed more often than right, the ratio is 4:1 and bilateral paralysis occurs in about 6% of the cases. Men are effected 8 times more than females. Vocal cord paralysis may be unilateral or bilateral, abductor or adductor. The cord is often described as being either in midline or in the lateral or cadaveric position. Semon's theory proposes that abductor fibers are more susceptible to pressure than adductor fibres.⁴ In unilateral abductor vocal cord paralysis, paralyzed vocal cord lies in the paramedian position. In unilateral adductor palsy, the vocal fold lies in the lateral position and gives rise to husky voice. Bilateral abductor paralysis is usually the result of damage to both recurrent laryngeal nerves at thyroidectomy, vocal fold lies in paramedian position and voice is good but degree of stridor is variable. In bilateral abductor paralysis, both folds lie in paramedian position⁵ Paediatric patients with vocal cord palsy usually have a good voice or cry and a poor airway.⁶ Vocal cord paralysis is the second most common cause of neonatal stridor. Congenital vocal cord paralysis has been known to undergo spontaneous recovery, it is generally accepted airway interventions such as tracheostomy is required in over 50% of affected patients.⁷ Paralysis of the bilateral recurrent laryngeal nerves results in the cords assuming the position of abduction is a very serious medical problem. The patient has no voice, aspirates freely and is without a cough reflex or the ability to laugh.⁸ The present study was undertaken to find the incidence, male to female ratio, age of involvement, commonly involved side, causes and the position of involved cord/cords in patients of vocal cord paralysis attending out-patient department of ENT.

MATERIAL AND METHODS

The present study included all the cases having vocal cord paralysis in out-patient department of Otorhinolaryngology, Head and Neck Surgery, SMGS Hospital, for a period of one year (May 2014 to May 2015). The study included a detailed history and complete physical examination with relevant investigations. Special emphasis was given to the symptoms of hoarseness, cough, hemoptysis, dysphagia, difficulty in breathing and fatigue of voice and all the symptoms were recorded in a predefined performa. Relevant past history, such as history of tuberculosis, previous surgery, malignancy and other systemic disease etc. was taken and special attention

was given to the personal habits like smoking, alcohol and vocal habits. Complete general physical examination and systemic examination was carried out to rule out any associated disease. A thorough ENT examination of oral cavity, oropharynx, nose and paranasal sinuses, neck and ears were performed with special reference to examination of larynx which included external examination for mobility, crepitus, expansion of laryngeal framework, indirect laryngoscopy to look especially for vocal cord movement, position of vocal cords, side of paralysis and direct laryngoscopy in cases where indirect laryngoscopy examination was not possible or where detailed examination of larynx was needed. Routine investigations like haemogram, urine examination kidney function tests, liver function tests, X-ray chest (P/A view), X-ray soft tissue neck(lateral view), X-ray nasopharynx(lateral view) were undertaken in all the patients. Special investigations like barium study of esophagus, CT-Scan, MRI, esophagoscopy, bronchoscopy, sputum examination for tuberculosis were done as and when required.

OBSERVATION AND RESULTS

As shown in table 1, total numbers of patients were 46, with male to female ratio of 1:1 comprising of 23 (50%) males and 23 (50%) females. The majority of the patients in our study were in 40 to 70 age groups comprising 36 (78.26%) patients. Least number of patients were found in the age group under 30.

Table 1: Age and sex distribution of patients of vocal cord paralysis

Age in Years	No. of patients				Total	
	Males		Females		No.	%
	No.	%	%	No.		
10-20	1	2.17	0	0	1	2.17
21-30	0	0	1	2.17	1	2.17
31-40	1	2.17	3	6.52	4	8.69
41-50	4	8.69	6	13.04	10	21.73
51-60	7	17.34	4	8.69	11	23.91
71-80	3	6.52	0	0	3	6.52
81-90	1	2.17	0	0	1	2.17
Total	23	50	23	50	46	100

The most common presenting complaint in our patients was hoarseness, present in all 46 patients, with hoarseness alone in 13 (23.36%) patients. The second common presentation in our study was a combination of hoarseness, dysphagia and fatigue of voice in 9 (19.56%) patients. Least common presentation in our study was a combination of hoarseness, breathlessness and dysphagia. [Table 2]

Table 2: Presenting complaints of patients of vocal cord paralysis

Sr. No.	Presenting complaints	No.	%
1	Hoarseness alone	13	28.26
2	Hoarseness+breathlessness	6	13.04
3	Hoarseness+ Dysphagia	3	6.52
4	Hoarseness+Fatigue of voice	7	15.21
5	Hoarseness+breathlessness+Fatigue of voice	9	19.56
6	Hoarseness+ breathlessness+ Dysphagia	1	2.17
7	Hoarseness+ Dysphagia+ Fatigue of voice	2	4.37
8	Hoarseness+breathlessness+Fatigue of voice+ Dysphagia	5	10.87

Largest group, 21 (45.65%) patients, in our study group was non-smoker as well as non-alcoholic. The second largest groups in our study, 11 (23.91%) patients, were smoker as well as alcoholic. The third largest group, with 10 (21.74%) patients was smokers alone. Lowest group in our study, with 4 (8.69%) patients, were alcoholic alone. [Table 3]

Table 3: Personal habits of patients of vocal cord paralysis

Sr. No.	Personal Habits	Total	
		No.	%
1	Smoker only	10	21.74
2	Alcoholic only	4	8.69
3	Both smoker and Alcoholic	11	23.91
4	Non-Smoker and Non- Alcoholic	21	45.65
Total		46	100

Shown in table 4, the most common position of vocal chord in our study was paramedian. The least common position was median. Cadaveric position was seen in 2 (4.34%).

Table 4: Position of cords in vocal cord paralysis

Sr. No.	Aetiology	Paramedian	Median	Cadaveric	Total
1	Neoplasms	16	1	2	19
2	Surgical	9	0	0	9
3	Idiopathic	8	0	1	9
4	Inflammatory	8	0	0	8
5	Infectious	1	0	0	1
Total		42(91.30%)	1(2.17%)	3(6.52%)	46(100%)

Left vocal cord was the most commonly involved and was observed in 28 (60.8%) patients, with neoplasm responsible for 15 (32.6%) patients. Right vocal cord involvement was found in 17 (37%) patients, with surgery being the most common cause in 7 (15.21%). Unilateral vocal cord paralysis was present in majority of our patients comprising 45 (97.52%) patients with bilateral cord involvement in only 1 (2.17%) patient. [Table 5]

Table 5: Side of vocal cord involvement

Sr. No.	Aetiology	Vocal cord			Total
		Right	Left	Bilateral	
1	Neoplasm	1	15	01	19
2	Surgical	7	2	0	9
3	Idiopathic	5	4	0	9
4	Inflammatory(Tuberculosis)	2	6	0	8
5	Infectious (Thyroiditis)	0	1	0	1
Total		17(37%)	28(60.8%)	01(2.17%)	46(100%)

X- ray chest, P/A view showed upper lobe fibrotic lesions, suggestive of pulmonary tuberculosis, in 6 (13%) patients. X-ray chest also showed collapse of lungs in 2 (4.34%) patients, mediastinal widening in 1 (2.17%) patient and soft tissue density in the lung fields in 4 (8.69%) patients. Barium swallow esophagus showed narrowing of esophageal wall with irregular margins in 7 (15.21%) patients. CT-scan of neck and chest, revealed soft tissue density mass in the lung fields in 7 (15.21%) patients, thyroid mass in 2 (4.34%) patients and mediastinal mass in 1 (2.17%) patient. MRI of head and neck showed space occupying lesion in 2 (4.34%) patients. Fibre optic bronchoscopy was done in selected patients which showed mass in the bronchial lumen in 4 (8.69%) patients and extrinsic compression with narrowing of bronchial wall in 3 (6.52%) patients. Black carbon particles in the bronchial lumen, suggestive of tuberculosis, were seen in 7 (15.21%) patients. [Table 6]

Table 6: Radiological findings

Sr. No.	Radiological investigation	Findings	Number	%
1	X-ray chest, P/A view	1. Upper lobe fibrotic lesions in lungs.	6	13
		2. Collapse of left lung	2	4.34
		3. Mediastinal widening	1	2.17
		4. Soft tissue density in the lung field.	4	8.69
2	Barium swallow esophagus	Narrowing of lumen with irregular margins	7	15.21
		1. Soft tissue density mass in the lung field.	7	15.21
3	CT-scan, Neck and Chest	2. Mediastinal mass.	1	2.17
		3. Thyroid mass	2	4.34
		Space occupying lesions at the base of skull	2	4.34
4	MRI	lesions at the base of skull	2	4.34

Neoplasms were the most common cause of vocal cord paralysis observed in 19 (38.78%) patients followed by surgical and idiopathic causes in 9 (19.56%) patients. Tubercular and infectious (acute thyroiditis) causes of

vocal cord paralysis were found in 8 (17.39%) and 1(2.17%) patients respectively.[Table 7]

Table 7: Etiology of vocal cord paralysis

Sr. No.	Aetiology	Patients	Percentage
1	Neoplastic	19	13.33
2	Surgery	9	19.56
3	Idiopathic	9	19.56
4	Inflammatory	8	17.39
5	Infectious	1	2.17
Total		46	100

Among neoplasms, carcinoma lung and carcinoma esophagus were the leading causes of vocal cord paralysis, comprising 7 (36.84%) patients each. Other less common causes of vocal cord paralysis in our study were central nervous system tumors (10.52%). [Table 8]

Table 8: Incidence of neoplastic causes of vocal cord paralysis

Sr. No.	Aetiology	Patients	Percentage
1	Carcinoma lung	7	36.84
2	Carcinoma oesophagus	7	36.84
3	CNS Tumours	2	10.52
4	Other Tumours	3	15.78
Total		19	100

Among the non-neoplastic causes of vocal cord paralysis, surgical and idiopathic causes were found in 9 (33.33%) patients each, followed by inflammatory (TB) and infectious (thyroiditis) in 8 (29.62%) and 1(3.7%) patients, respectively.[Table 9]

Table 9: Incidence of non-neoplastic causes of vocal cord paralysis

Sr. No	Aetiology	Patients	Percentage
1	Surgery	9	33.33
2	Idiopathic	9	33.33
3	Inflammatory(Tuberculosis)	8	29.62
4	Infectious (thyroiditis)	1	3.7
Total		27	100

DISCUSSION

Vocal cord paralysis must be regarded as a sign of underlying disease, not simply a diagnosis unto itself. Thus every attempt should be made to find the cause of vocal cord paralysis. Our study was a prospective study conducted over a period of one year in which 46 patients with vocal cord paralysis were evaluated to find out the etiology, clinical profile, laterality and position of vocal cord paralysis. In our study, only patients with neurological causes of vocal cord paralysis were taken as inclusion criteria and the patients with fixity of vocal cord due to tumour infiltration or crico-arytenoid joint fixation were excluded from the study. A complete history was taken in every patient of vocal cord paralysis attending ENT OPD in our department. A thorough physical examination was performed. The patients were then investigated thoroughly. CT Scan Neck and chest,

bronchoscopy, barium study of oesophagus and esophagoscopy were the most common special investigations done in our study. Even after thorough workup, no cause was found in many cases which were labelled as idiopathic. there has been a changing etiology of vocal cord paralysis perhaps due to the availability of better investigations which are now available, that is why the incidence of idiopathic causes of vocal cord palsy is decreasing. With regard to clinical profile, the median age of vocal cord paralysis in our study was 60 years with a male to female ratio of 1: 1 which was in accordance with other studies. The main clinical presentation was hoarseness of voice which was present in all the patients followed by a combination of hoarseness, breathlessness and fatigue of voice with the least common presentation being a combination of hoarseness, breathlessness and dysphagia. As far as etiology of vocal cord paralysis is concerned, neoplasms were the most common cause responsible for vocal cord paralysis in our study. Overall, neoplasms were responsible for vocal cord paralysis in 19 (33.33%). Lung and esophageal malignancies were found as etiological factor in 7 (15.2%) patients each and were the most common malignancies responsible for vocal cord paralysis in our study. Other tumours responsible were cerebello-pontine angle tumours, mediastinal lymphoma and 2 cases of thyroid malignancy. Parnel in his longitudinal study, observed neoplasms as the etiological factor in 34.8% cases, of which 17.4% each were due to lung and esophageal malignancies; Maisel *et al* (1974) in 25.5% cases, of which 8.7% were due to lung malignancy; Titcher *et al* (1996) in 38.1% cases, out of which 22.4% were due to lung malignancy and Terris *et al* (1992) in 40.5% cases, of which 16.7% were due to lung malignancy.⁹⁻¹² The results of these studies do agree closely with result of our study. Thyroid surgery was found as etiological factor in 9 (19.56%) patients in our study. In Parnell’s study (1970),thyroid surgery was found as an etiological factor in 19.8% cases, 8.7% in Maisel’s Study (1974),3.7% in Titcher’s study (1976) and 8.3% in Terris study (1992).⁹⁻¹² Our incidence of post-thyroidectomy vocal card paralysis was in accordance to other studies. In our study, no extra- thyroid surgery was found to be the etiological factor. Vocal cord paralysis as a consequence of thyroid surgery can be prevented by doing the surgery meticulously, by identifying the recurrent laryngeal nerve during thyroidectomy. Thus by meticulous surgery, many cases of the post-thyroidectomy vocal cord paralysis can be prevented. Even after thorough workup to find the cause of vocal cord paralysis, no cause was found in some patients. In our study, idiopathic causes were responsible for vocal cord paralysis in 9 (19.56%) patients was almost consistent with 26.8% in Maisel’s study (1974).^[10]

Tuberculosis as an etiological factor was more significantly found in our patients accounting for 17.39% which is not consistent with Stell and Maran's study (2004) where only 5% vocal cord paralyses were due to inflammatory causes.¹³ The reason for the higher incidence of vocal cord paralysis can be attributed to the higher incidence of tuberculosis in this region. This implies that by controlling tuberculosis, some cases of vocal cord paralysis can be prevented. So far as the side of vocal cord involvement is concerned, left vocal cord was most commonly involved in our study. Left side was involved in 28 (60.86%) patients and right side affection was seen in 17 (37%) patients. Bilateral vocal cord involvement was seen in only 1 (2.17%) patient who was suffering from oesophageal carcinoma. These results were consistent with other studies. The more involvement of left vocal cord was justified by longer course of left recurrent laryngeal nerve which was thus more vulnerable. In case of vocal cord paralysis secondary to thyroid surgery, right vocal cord involvement was seen in majority of patients which may be attributed to more superficial course of right recurrent laryngeal nerve. The most common position of vocal cord in our study was paramedian which was present in 42 (91.30%) patients, with paramedian and median positions in 3 (6.52%) and 1 (2.12%) patients, respectively.

CONCLUSION

Forty six patients of vocal cord paralysis diagnosed in our ENT OPD, during one year period, which extended from May 2014 to May 2015, were taken in this prospective study. Majority of our patients were above 40 years of age, with maximum number of patients in the age group of 61 – 70 years with no significant sex difference. Unilateral vocal cord paralysis was much more common than the bilateral vocal cord paralysis with Left vocal cord involvement seen in majority of patient and right vocal cord involvement predominantly seen in patients undergoing thyroidectomy. Neoplasms were found to be the most common cause of vocal cord paralysis in our study with bronchogenic and oesophageal carcinomas being the leading causes, comprising 7 (15.2 %) patients each. Many of the cases of this group can be diagnosed if properly investigated by non-ENT specialists well before the vocal cord paralysis became the presenting feature. Thyroidectomy was found to be one of the leading cause of vocal cord paralysis and most common cause amongst iatrogenic group. Thus by avoiding injury to recurrent

laryngeal nerve, most of the traumatic vocal cord paralysis can be prevented. The incidence of idiopathic causes is decreasing largely as a result of better investigations like CT- Scan, MRI and Endoscopies available these days. Thus every attempt should be made before labelling it as idiopathic vocal cord paralysis. The incidence of vocal paralysis, secondary to pulmonary tuberculosis, was high probably as a consequence of high incidence of tuberculosis in this region.

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Source of Support: None Declared
Conflict of Interest: None Declared