ORIGINAL ARTICLE

Unilateral Vocal Cord Palsy: An Etiopathological Study

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ABSTRACT

Objective: The incidence of various causes of unilateral vocal cord palsy (UVCP) has been found to change over time and place. To arrive at the correct diagnosis is important in determining the prognosis as well as the time and mode of intervention.This study intends to evaluate the current etiological profile of unilateral vocal cord palsy in our center and compare it with the previous studies.

Methods: A retrospective study of case records of all consecutive patients with a diagnosis of UVCP presented to Kerala Institute of Medical Sciences,Thiruvananthapuram, Kerala, South India in the period between September 2002 and May 2009 was conducted. The exclusion criteria were all laryngeal and hypopharyngeal malignancies, intubation injuries and cricoarytenoid joint ankylosis. Factors taken for analysis were age, gender, side of palsy and etiology.

Results: A total of 121 cases including 88 males and 33 females in the age range of 2 to 86 years were studied. 61.1% patients had left-sided palsy and 38.8% had right-sided palsy.The incidence of various etiologies were idiopathic (42.1%), surgical trauma (22.3%), nonsurgical trauma (6.61%), nonlaryngeal malignancy (6.61%), central (12.4%) and other benign lesions (9.09%). The incidence of all nonthyroidectomy surgeries together (59.3%) was more than that of thyroidectomy (40.7%). The most common individual surgical procedure was still thyroidectomy (11 cases, 40.7%) followed by coronary artery bypass grafting (CABG) (7 cases, 25.9%).

Conclusion: Idiopathic vocal cord palsy constituted the major subgroup .Thyroidectomy continues to be the single most common surgical procedure responsible for vocal cord palsy. Cardiac surgeries, trauma and cerebrovascular accidents are also increasingly causing vocal cord palsy, which is suggestive of the changing trend in life style and life expectancy. The right recurrent laryngeal nerve is not at higher risk than the left in thyroid surgery. Benign thyroid swellings also contribute significantly to UVCP.

Keywords: Unilateral, Vocal cord palsy, Etiology.

INTRODUCTION

Unilateral vocal cord palsy (UVCP) is not an uncommon finding in ENT practice. It is not a diagnosis by itself. The exact incidence of UVCP has been difficult to find out because of multiple reasons. Many cases are underdiagnosed because of spontaneous recovery or compensation by the opposite cord. Also, a good number of patients with postoperative hoarseness do not undergo a laryngoscopic evaluation.[1]

It has been found that etiology of UVCP shows a changing trend varying with time and place of study. In 1930's aortic aneurysm (syphilitic) and thyroidectomy were the most common causes of UVCP. Many of those conditions, like syphilitic aneurysm and tuberculous mediastinal nodes became rare or disappeared.[2] The relative incidence of nonlaryngeal malignancy increased and it became the most frequent cause of UVCP in 90's. With technological advances in anesthesia and surgery, the relative number of other surgical procedures like anterior cervical spine surgery, carotid endarterectomy, skull base procedures, etc. with the potential for recurrent nerve paralysis went up and thus brought down the relative incidence of thyroidectomy induced UVCP. However, the incidence of UVCP of unknown cause (idiopathic) has not reduced despite advances in imaging.[2]

Medline search of papers on etiology of UVCP found a large number of studies from different parts of the world but hardly any from Indian subcontinent in the last 30 years. This study intends to look into the current etiological trends in our center and compare them with previous studies.

MATERIALS AND METHODS

The present study was a retrospective chart review of all consecutive patients with unilateral vocal cord palsy (UVCP) due to recurrent laryngeal nerve paralysis presented to the department of ENT and Laryngology at Kerala Institute of Medical Sciences, Thiruvananthapuram, Kerala, India, in the period from November 2002 to May 2009. The exclusion criteria were all laryngeal and hypopharyngeal malignancies resulting in mechanical fixation of vocal cords, doubtful or diagnosed cases of cricoarytenoid ankylosis and all intubation injuries. A total of 121 case records were considered after exclusion. There were 87 males and 33 females with age ranging from 2 to 86 years.

All patients underwent detailed work-up including history, physical examination, flexible fiberoptic and/or stroboscopic evaluation of larynx and imaging by computerized tomographic (CT) scanning of neck from skull base to sternal angle when clinical history itself did not reveal the etiology. Other additional

investigations like fine needle aspiration cytology, CT scanning of the brain/chest and barium esophagogram were done as necessary. Laryngeal EMG was not routinely employed. Hence, intubation injuries were not considered for the analysis. A case was labeled idiopathic when all the investigations were found to be normal.

RESULTS

Around 121 subjects in the age range of 2 to 86 years (mean age–46.52 years) were studied. There were 88 males (72.3%) and 33 females (27.3%) with a mean age of 47.5 and 43.93 years respectively. The incidence of various etiologies were idiopathic 42.1% (n = 51), surgical trauma (iatrogenic) 22.3 % (n = 27), nonsurgical trauma 6.61% (n = 8), malignancy 6.61% (n = 8), central 12.4% (n = 15) and other benign lesions 9.09% (n = 11).

47 (38.8%) cases were right-sided palsies and 74 (61.1%) were left-sided. On comparing right and left sides, the incidence of different etiologies were respectively, 31.9% and 48.6% in idiopathic, 25.53% and 20.2 % in surgical trauma, 8.5% and 8.5% in malignancy, 8.5% and 10.63% in nonsurgical trauma, 17.02% and 8.10% in central, and 8.51% and 9.4% in other benign lesions.

Males outnumbered females in all categories except in surgical trauma (males–17.04%, females–36.36%).The incidence of idiopathic UVCP were 40.45% and 33.3% and that of malignancy 7.95% and 3.03% respectively among males and females.

The incidence of unilateral vocal cord palsy has been found to increase with age and peak in the sixth decade. Both idiopathic and iatrogenic cases were distributed through all decades of life unlike malignancy and central pathology. Idiopathic group was a leading cause among all age groups barring extremes of life. The incidence of idiopathic UVCP was seen to rise gradually, peak in the fifth decade and then decline. The maximum number of iatrogenic cases were found in the sixth decade. In the first decade of life, iatrogenic UVCP (n = 2) was the leading cause (Fig. 1). The only other cause in this group was idiopathic (n = 1). Seven out of 8 cases of nonsurgical trauma were due to road traffic accidents and found to be concentrated in the fourth decade. Central pathology was the leading cause in seventh decade, but not found in first to fourth decades. It was interesting to note that there were two peaks for malignancy in fourth and sixth decades.

12 cases (23.5%) in idiopathic group had associated diabetes (pre-existing). Sixteen patients (31.4%) reported h/o URI preceding the onset of idiopathic UVCP. One patient had past history of vasculitis. The mean age of idiopathic group was 45.9 years.

The mean age in nonlaryngeal malignancy group (n = 8) was 53.5 years.The most common causes were metastases in the neck from lung parenchyma (n = 2), bronchus (n = 1), breast (n = 1), stomach (n = 1), and an unknown primary (n = 1). There were also two cases of thyroid cancer (papillary). Males constituted the majority (n = 7). Equal incidence was seen for right and left sides.

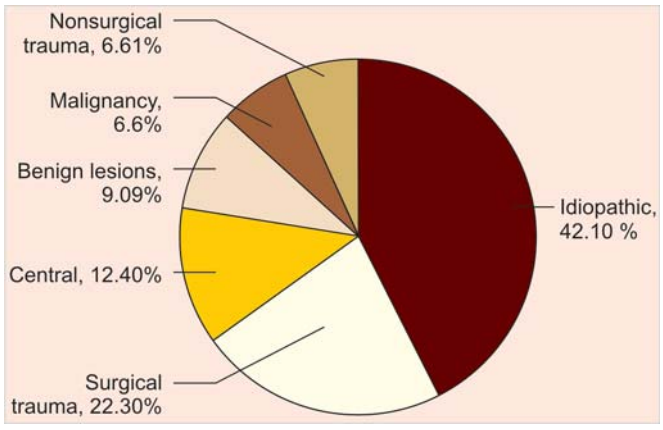

Fig. 1: Etiological distribution of UVCP

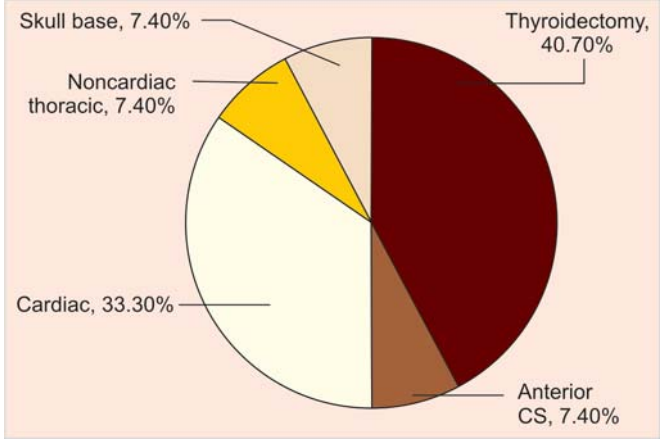

Fig. 2: Surgical causes of UVCP

Table 1: Distribution of surgical causes

Group	*Name*	*n*	*Percentage*
Head	Skull base	2	7.4
	Petroclival meningioma	1	
	Jugular foramen schwannoma	1	
Neck	Thyroidectomy	11	40.7
	Total thyroidectomy	7	
	Near total thyroidectomy	2	
	Hemithyroiodectomy	1	
	Revision thyroidectomy	1	
	Carotid tumor	1	3.7
	Anterior cervical spine	2	7.4
Thoracic	Cardiac	9	33.3
	CABG	7	
	PDA	1	
	Aortic arch anomaly	1	
	Noncardiac	2	7.4
	Esophagectomy	1	
	Tracheoesophabeal fistula repair	1	

Surgical causes (n = 27) were grouped into head, neck and thoracic procedures (Table 1). There were two skull base procedures (1.6%), one for petroclival meningioma and the other for jugular foramen schwannoma. Thyroidectomy was the cause of paralysis in 11 cases (40.7%) of which 7 were total thyroidectomy, 2 near total thyroidectomy, 1 hemithyroi-

dectomy and 1 revision thyroidectomy (Fig. 2). The histopathological diagnoses were papillary carcinoma (n = 2), toxic goiter (n = 2), colloid (n = 3), combined papillary and toxic (n = 1), Hurthle cell adenoma (n = 1) and unknown (n = 2). There were 9 females and 2 males in this group. Left nerve was injured in 6 cases and the right in 5.

There were two anterior cervical spine surgeries (1.6%) both with a right-sided approach and right side weakness. Another cervical procedure was carotid tumor surgery (n = 1). Among the 9 cardiac procedures, there were 7 coronary artery bypass grafting (CABG), 1 PDA ligation and 1 aortic arch anomaly. Other intrathoracic procedures that caused UVCP were esophagectomy (n = 1) and tracheoesophageal fistula repair (n = 1). Around six out of seven in CABG group had left-sided UVCP. Left side was again involved in 3 other intrathoracic procedures. Esophagectomy was associated with right palsy.

Seven cases of nonsurgical trauma (n = 8) were due to road traffic accidents. The mean age in this group was 42 years and males constituted the vast majority (75%). Right and left sides had equal incidence, 50% were due to head injury.

Of the cases due to central nervous system involvement (n = 15) the mean age was 64 years and showing strong male preponderance (86.7%). Major cause was posterior circulation stroke (46.7%).

There were 11 benign causes of vocal cord palsy. Seven thyroid lesions (63.63%) including colloid goiter (n = 5) with hemorrhage in two cases, cyst (n = 1), and Hashimotos thyroiditis (n = 1) were found. Other benign lesions that we came across were mediastinal tuberculosis (n = 1), bronchopulmonary aspergillosis (n = 1) and acoustic neuroma (n = 1). There also was a case of cardiovocal syndrome (Ortner's syndrome) following longstanding mitral regurgitation causing left UVCP.

Among all patients who presented with a neck swelling and UVCP (n = 14), the incidence of malignancy (53.85%) exceeded that of benign lesions (46.15%). The ratio was 3:1 in males, but the proportion was almost the reverse in females (1:4). Similarly when only thyroid swellings (n = 8) were considered, the number of benign lesions (n = 6) outnumbered malignancy (n = 2). Two benign cases which presented with a history of acute pain in the neck and vocal cord weakness showed hemorrhage into the nodules on imaging.

DISCUSSION

Though scientific literature is replete with etiological data of vocal cord palsy in Western population, there is little information about Indian scenario. The present study probed into the etiopathological pattern of unilateral vocal cord palsy in our center, a tertiary care center for laryngeal disorders. It brought out some interesting facts.

Regarding the age, our patients were almost a decade younger in comparison. The mean age in our series were 47.5 for males and 43.93 for females compared to Yumoto et al series from Japan in which they were 57.8 and 53.6 respectively.[3] This may be because of the higher life expectancy in affluent nations. The incidence of UVCP was found to increase with age, rising rapidly in the fourth decade and peaking in the sixth decade. Yumoto and Yamada have also reported increased incidence with age.[3,4]

The peak incidences of idiopathic and iatrogenic cases were in the fifth and sixth decades respectively. The peaks of malignancy were found in the fourth and sixth decades. Central etiology as expected was highest in the seventh decade.

The male to female ratio was more than one in majority of the series.[1,2] We found 72.3% incidence in males which was higher in comparison (Table 2). Rosenthal in his study of 363 patients reported more incidence in females (58%).[5] A study from Taiwan (161 patients) also reported nearly double the incidence in females.[6]

The 61.1% involvement of left side and 38.8% of right side in UVCP were not surprising.[1,2] This is probably due to the increased vulnerability of left nerve due to the longer course through the chest.

In our study, the proportion of various etiologies were 42.1% idiopathic (n = 51), 22.3% surgical trauma (n = 27), 6.61% nonsurgical trauma (n = 8), 6.61% malignancy (n = 8), 12.4% central (n = 15) and 9.09% other benign lesions (n = 11) (Fig. 3). The leading cause of UVCP according to historical

Table 2: Comparison of etiologies

Study	*Year*	*Number of cases*	*Males(%)*	*Left/Right(%)*	*Malignancy(%)*	*Surgical*	*Nonsurgical trauma(%)*	*Central(%)*	*Other benign(%)*	*Idiopathic(%)*
Terris et al	1992	84	54	68/32	40	35	1	2	4	11
Ramadan et	1998	98	67	70/30	32	30	7	8	3	16
Benninger	1998	280	58	63/37	25	24	11	8	5	20
Havas et al	1999	108	50	65/35	5	40	4	7	9	33
Srirompotong	2001	90	52	73/27	29	24	6	4	0	34
Yumoto et al	2002	422		283/139	25.7	40.6	2.5			12
Rosenthal et	2005	363	42	61/39	13.5	46.3	2.2	3		17.6
Ko et al	2009	161	35	68/32	12	48	7			22
Present study	2010	121	72.3	61/39	6.6	22.3	6.6	12.4	9	42.1

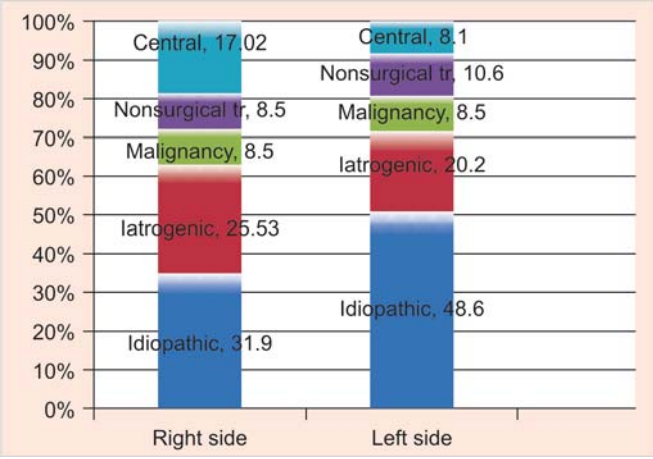

Fig. 3: Incidence of various etiologies in right and left sides

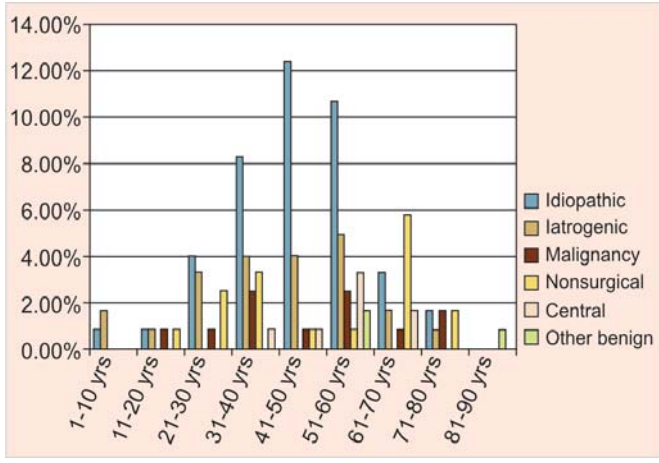

Fig. 4: Age distribution of UVCP

reports was syphilitic aortic aneurysm in the early part of 20th century.[2] Nonlaryngeal malignancy had a higher incidence in the late 90's,[1,2,7] which then declined as the relative incidence of iatrogenic cases showed an increasing trend.[3,5,6] Rosenthal found 46% of iatrogenic cases while Ko et al found 48%. It is interesting to note that the relative incidence of idiopathic has not decreased in spite of advances in imaging.[2]

The incidence of surgical trauma and nonlaryngeal malignancy were relatively low in our study.We found a strikingly high incidence of idiopathic cases (42.1%) in comparison to Yumoto et al (12%), Rosenthal et al (17.6%) and Ko et al (22%). Many factors might have contributed to these figures. In our circumstances many of the postoperative UVCP may go unrecognized because a mild postoperative hoarseness is not immediately brought for laryngoscopic evaluation unless there is significant morbidity due to aspiration. And some of the UVCP recover eventually or get adequately compensated by the opposite cord.[2] Sixteen cases had a history of viral fever preceding UVCP. We did not count viral infection as a separate entity since adequate evidence supporting this was not available in this retrospective study. So, they were also included in the idiopathic group (31.4%). There are only case reports available which describe a definite association between recurrent laryngeal neuropathy and varicella-zoster, EBV or herpes simplex virus infections.[8-10] 23.5 % (n = 12) of idiopathic cases had pre-existing diabetes. The development of upper cranial nerve involvement in diabetes has been well-described, but paralysis of the tenth cranial nerve or its branch is rare.[11] It is possible that at least some cases in idiopathic group may be related to diabetes mellitus. It assumes greater significance in the state of Kerala since it has the highest incidence of diabetics in India. This calls for further prospective, population-based studies with strict follow-up to arrive at the exact incidence.

Thyroidectomy (40.7%) was the most common individual surgical procedure responsible for iatrogenic UVCP in our study. But the incidence of all nonthyroidecomy surgeries together (59.3%) surpassed that of thyroidectomies. This finding has been quoted by many others (Fig. 4). The incidence of nonthyroidectomy group has gone up from 0 in 1930's to 66% in Rosenthal series.[5] However, two recent series by Ko et al and Srirompotong have reported more incidence of thyroidectomy than nonthyroidectomy procedures.[6,12]

The most common type of thyroidectomy that resulted in UVCP was total thyroidectomy. Most studies have reported that revision surgery increases the risk of recurrent nerve injury.[2] Nerve injury is reported to be most common in malignancy followed by chronic lymphocytic thyroiditis.[1] The recurrent nerve has also been found to be at risk in surgery for hyperthyroidism. We could not draw any such definite association in our thyroidectomy cases. There was not any significant preference for sides either.

Rosenthal in his large series of 363 patients found an incidence of 66% for nonthyroidectomy surgeries which is exactly twice that of thyroidectomy. Among nonthyroidectomy surgeries, anterior cervical spine surgery (15%) was the most common procedure followed by carotid endarterectomy (11%), cardiac (9%) and thoracic surgeries (%) in his series.[5] Havas et al also found the highest incidence following anterior cervical spine surgery (12%) in nonthyroidectomy group, whereas carotid endarterectomy was the leading cause among all surgical procedures, even surpassing thyroidectomy in Kelchner series.[2] We did not come across any case of carotid endarterectomy in our study.

We found that CABG (n = 7) caused maximum number of UVCP among nonthyroidectomy group. This may be related to proportionately large number of cardiac procedures in our center and inpatient referral. The relative incidence of surgeries causing UVCP probably also depends on the referral pattern in the institution and other demographic parameters. The incidence of UVCP after CABG is reported to be 1 to 2%.[13] As expected, the vast majority were left-sided palsy (85%) in our study. Only few cases of right nerve palsy are reported following cardiac procedures.[13] We also found one case of right-sided palsy following CABG. The proposed mechanisms of injury causing UVCP are central venous catheterization, esophageal traction, median sternotomy causing lateral traction of both subclavian

arteries and direct manipulation and retraction of cardiac structures and subclavian arteries with more stretch injury to right nerve due to its shorter course.[2,13] Harvesting proximal internal mammary artery also puts the nerve at risk.[14] Hamdan has rightly suggested that postoperative hoarseness should not be assumed to be due to laryngeal edema but should undergo prompt laryngoscopic evaluation in order to avoid serious complications due to aspiration and inefficient cough.[13]

There were only 2 cases of anterior cervical spine surgery which resulted in vocal cord palsy. Both were right-sided temporary paralysis. RLN is not routinely identified during this surgey. Sharp dissection and excessive retractor pressure are mentioned as causes for the RLN palsy but some studies have pointed out the shorter and more obtuse course of the right RLN as the factor, which makes it more vulnerable to stretch.[15]

The incidence of nonlaryngeal malignancies shows a downward trend according to previous reports (Table 2). We found 8 cases (6.61%) of them responsible for UVCP, 7 of them on presentation had a neck swelling. The 28.6% were due to thyroid malignancy and the rest were due to metastases in the neck from lung, breast, stomach and from an unknown primary. There also was a case of bronchogenic carcinoma.

Many previous studies found the most common malignancy causing UVCP to originate from the lung[3,5,7] (Table 2). Ko et al found a 12% incidence of nonlaryngeal malignancy. Thyroid cancer (46%) was the leading cause. In their study, patients were primarily investigated with serial chest X-ray, ultrasonogram of neck and esophagoscopy. CT neck was not the first line investigation. They even found a case of lung cancer among idiopathic group after 2 years of follow-up with serial CXR.[6] This again points to the fact that prospective studies need to be undertaken to reach a consensus on the best cost-effective investigation protocol and follow-up period that has to be observed before a case is labeled idiopathic.

The mean age for malignancy was 53.5 years and there was male predominance (87.4%). Both sides were equally involved.

Idiopathic group was more common on left side (48.6%) in comparison to right (31.9%). Malignancy was equally distributed between right and left sides. In spite of its longer course through the chest on left side, a marked difference in incidence of malignancy between sides is not found in the earlier series also.[2] Surgically induced UVCP was more common on right (25.53%) than left (20.27%). Ko et al reported 64% and 38% incidence of right and left iatrogenic palsies respectively.[6] Many of the earlier studies also support this.[2] We found no significant difference in incidence of thyroidectomy induced vocal cord palsy between right (n = 5) and left (n = 6) sides.

Among those who presented with a neck mass and UVCP (n = 14), the incidence of malignancy (53.85%) exceeded that of benign lesions (46.15%). The ratio was even more (3:1) in males, but the proportion was almost the reverse in females (1:4). Also when only thyroid swellings were considered, benign lesions (75%) outnumbered malignancy (25%). The majority were colloid goiters (5) with sudden hemorrhage into the nodule in 2, resulting in acute onset vocal cord paralysis. This 75% incidence of benign thyroid enlargements causing preoperative vocal cord palsy has been reported previously by Rowe-Jones. Inflammation and edema of the recurrent laryngeal nerve secondary to the benign thyroid lesion results in paralysis.[2] Rosenthal in his study on 383 patients with UVCP did not mention benign thyroid tumors.[5]

The proportion of unilateral recurrent nerve paralysis due to thyroidectomy was 9% in our series. This is relatively low in comparison to others.[5,6] So, this may be tempting to believe that thyroidectomy techniques are getting more nerve friendly. But when we examined our series of bilateral recurrent nerve paralysis, within the same period of study it was found that 57 cases (61%) out of 93 resulted from thyroid surgery (Table 3).

Table 3: Comparison of incidence of surgical procedures

Study	*Year*	*Number of* surgical cases	*Thyroid (%)*	*Nonthyroid (%)*	*Ant. C spine (%)*	*Cardiac (%)*	*Carotid* endart (%)	*Thoracic (%)*	Neurosurgery (%)	Skull base (%)
New et al	1932	26	100 #	0	–	–	–	–	–	–
Clerf et al	1953	61	97#	13	–	–	–	–	–	–
Parnell et al	1970	21	86#	14	–	–	–	14*	–	–
Yamada et al	1983	116	53#	47	–	–	–	27*	–	–
Terris et al	1992	29	24	76	–	–	–	–	–	–
Ramadan et al	1998	29	14	86	–	–	–	31*#	31*#	–
Benninger et al	1998	34	34	66	–	–	–	–	–	–
Havas et al	1999	43	67#	33	12*	–	–	–	–	–
Kelchner et al	1999	37	22	78	19	–	27#*	16	11	–
Srirompotong et al	2001	22	59#	41	–	–	–	–	–	–
Yumoto et al	2002		49#	51	–	10	–	21*	1.3	3
Rosenthal et al	2005	168	33#	66	15*	9	11	8	5	2
Ko et al	2009	78	65#	35	4	–	1	17*	13*	–
Present study	2010	27	40.7#	59.3	7.4	33.3*		7.4*	0	7.4

(# most common procedure,*most common nonthyroidectomy procedure)

This very high figure underlines the fact that recurrent nerve is still very much at risk in thyroid surgery, which should alert the surgeon towards adopting safer thyroidectomy techniques and religiously following them.

CONCLUSION

Idiopathic was the major subgroup which may be due to many different causes. Probably all post-thyroidectomy UVCP are not attending the ENT clinics. Left recurrent laryngeal nerve because of its long course is susceptible to damage from trauma, tumor and metastasis. Thyroidectomy continues to be the single most common surgical procedure responsible for UVCP. The right recurrent laryngeal nerve is not at higher risk than the left in thyroid surgery. As against common belief, benign thyroid swellings contribute significantly to recurrent laryngeal nerve paralysis. Trauma, cerebrovascular accidents and cardiac surgery contribute to a significant percentage, which is suggestive of the changing trend in lifestyle and life expectancy. Routine preoperative and postoperative laryngoscopy should be considered in all surgeries with a potential for recurrent nerve paralysis to reduce the postoperative morbidity.

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