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PRE-OPERATIVE VOCAL CORD PALSY IN GOITRE PATIENT

H .K. OMOKANYE, S. SEGUN-BUSARI, S.A. OLATOKE, M.M.B. UTHMAN and F. E. OLOGE

ABSTRACT

***Objectives*: Determine the prevalence of vocal cord palsy and the relative prevalence of asymptomatic vocal cord palsy in pre-operative goitre patients using flexible fibre-optic laryngoscope (FFL) as a laryngeal visualisation technique.**
***Design*: Hospital-based, cross-sectional study conducted throughout 2011 on consecutive, consenting pre-operative goitre patients referred to the E.N.T Department, University of Ilorin Teaching Hospital. Ilorin, Nigeria.**
***Setting*: University of Ilorin Teaching Hospital (U.I.T.H) Ilorin is a 600-bedded tertiary institution, serving primarily patients from Kwara State.**
***Subjects*: One hundred and ten consenting patients, age 16 and above- whose cooperation could easily be gained for an awake-laryngoscopy procedure.**
***Results*: Mean age, 42.98 ± 14.71. Female: Male = 4.5:1. Palsy rate was 2.9% and 25% in benign and malignant goitre respectively. Hoarseness was reported by 3(2.7%) patients with vocal cord palsy (p 0.001). Asymptomatic palsy was 40%.**
***Conclusion*: The prevalence of pre-operative vocal cord palsy was 4.5%; Relative prevalence was 2.9% and relative prevalence was 25% in benign and malignant goitre respectively.**

INTRODUCTION

Goitre is a common problem worldwide and thyroid surgery is frequently performed (1). It has been estimated by The World Health Organization (W.H.O) that there are at least 200 million people in the world with goitres (2,3). The prevalence of goitre ranges from nearly zero to 80% of population in iodine deficient geographical areas, Nigeria inclusive (4,5). And 7% of the world's population are identified by W.H.O as suffering from clinically apparent goitre (4). The value of precision in vocal cord visualisation before thyroid surgery cannot be over emphasised as it has a medico-legal importance in the management of the goitre patient.

Awake-flexible fibre-optic laryngoscopy allows inspection of the vocal cords during phonation and quiet respiration. It is a simple, accurate, safe and easy-to-use technique, relevant in the pre-operative assessment of goitre patients both in the clinic and day surgery unit. Up till date, however, Indirect laryngoscopy (IDL) is still widely used in pre-operative assessment of goitre patients to determine the mobility of the vocal cords and detect recurrent laryngeal nerve palsy prior to surgery (2,3). The popularity still enjoyed by IDL among otolaryngologists in Nigeria and other developing countries is mainly due to its accessibility and

affordability. As a matter of fact, Flexible Fibre-optic Laryngoscope is available only in few tertiary health centres in the country.

As a technique of laryngeal visualisation, indirect laryngoscopy is prone to a number of limitations (6-8) which includes significant failure rate as a result of patient not tolerating the procedure or the view of the vocal cords being obstructed by an overhanging epiglottis. These, prior to the advent of flexible endoscopy, often mandate direct laryngoscopy under general anaesthesia (9, 10).

As more and more Otolaryngologists in Nigeria take up the role of managing goitre patients, this study stresses the importance of pre-operative vocal cord visualisation as a measure of recurrent laryngeal nerve involvement in goitre patients, particularly in this era of heightened patient awareness and medico-legal climate. It also demonstrates the usefulness of flexible fibre-optic laryngoscopy as a laryngeal visualisation technique.

MATERIALS AND METHOD

The study was a hospital-based, cross-sectional study; conducted on all consecutive, consenting 110 pre-operative goitre patients referred to the Ear Nose and Throat Department, University of Ilorin Teaching Hospital Ilorin, Nigeria during the study period. A proforma was used to collect relevant information from the participants, this included bio-data, and presenting symptoms. Neck examination was carried out followed by anaesthetic preparations of nasal cavity and oropharynx with generous spray of 4% lignocaine in 1: 200,000 Adrenaline, in order to achieve anaesthesia and decongestion. Additionally the stem of the scope was lubricated with K-Y gel to enhance easy passage (11). Ten (10) minute was allowed for the local anaesthetic agent to take effect. PENTAX FNL-l0 RBS flexible fibre- optic laryngoscope was gently passed into the nasal cavity and gradually advanced under visualisation along the anaesthetised floor of the nasal cavity into the nasopharynx. Once the endoscope was manoeuvred into the post nasal space, the patient was asked to inspire through the nose, this opens the post nasal sphincter allowing negotiation of the endoscope into the laryngeal inlet via the oropharynx.

A step-wise assessment of the larynx was made (12); the epiglottis and valleculae were inspected, followed by the supraglottis, glottis and subglottis. The vocal cords were visualised and examined for position, mobility and symmetry at both quiet breathing and phonation. Where palsy was present, the side and its degree whether partial or complete were noted. The nature of the palsy whether adductor or abductor were also documented. A single investigator scoped subjects in order to remove inter-observer error. In all cases however, findings were confirmed by other experts in the team to ensure accuracy of diagnosis.

Results of fine needle aspiration cytology, thyroid function test, neck ultrasound, neck and chest X-ray were also reviewed. Data collected were checked for errors and analysed using SPSS version 17.0. Statistical analysis was carried out to produce frequency distribution tables, cross tabulations and appropriate statistical tests (Chi- Square). Chi-Square test was used to explore the association between categorical variables, which included; presenting symptoms, WHO grade of goitre, position and functionality of vocal cords, and cytology of goitre. P-value = 0.05 (5%) was considered significant at 95% confident level for any association between variables. Results were presented in simple charts and descriptive tables.

RESULT

A total of one hundred and ten (110) consecutive, consenting participants with a diagnosis of goitre, presence of anterior neck mass and satisfying the inclusion criteria were recruited for the study.

The socio-demographic character of the participants seen during the study period showed that 90 (81.8%) were females and 20(18.2) were males with a female to male ratio of 4.5:1 (Table 1).

The age of participants ranged from 19years to 80years with the mean age ± standard deviation of participant of 42.98 ± 14.71. The commonest age group in this study was 41- 50years with 31(28.1%) participants, while the 11-20years age group had the least frequency of 4(3.6%). (Table 1)

Socio-economic class (SEC) IV constituted the largest population of the participants 51(46.6%) while SEC I constituted the least (4.5%) of the participants' population. (Table 2)

Majority of participants 47(42.7%) presented to the hospital within the first year of onset of symptoms, while 2(1.8%) presented with the longest duration of symptoms (25-30) years. (Table 2)

Table 1
Sex distribution and age group of participants with goitre

Variables	Participants frequency	N=110 percentage
Gender		
Female	90	81.8
Male	20	18.2
Age range (years)		
11-20	4	3.6
21-30	26	23.6
31-40	19	17.3
41-50	31	28.1
51-60	15	13.6
61-70	10	9.0
71-80	5	4.5

Figure 1
Pie chart showing sex distribution of participants

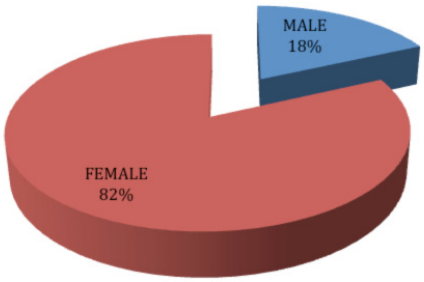


Table 2
Participants by socio-economic class and duration of stay in borstal institution (using Oyedeji20SEC as modified by Ogunlesi 21)

Variables	Participants (N=110)	
Socio-economic class	Frequency	Percentage
1	5	4.5
2	7	6.4
3	26	23.6
4	51	46.4
5	21	19.1
Duration of symptom (years)		
< 1	47	42.7
1-5	40	36.4
6-10	12	10.9
11-15	3	2.7
16-20	5	4.5
21-25	1	0.9
25-30	2	1.8

Table 3
Participants by clinical type of goitre, lobe involved and WHO grade

Goitre Type	Participants (n=110)	(%)
Simple multinodular	81	73.6
Simple diffuse	3	2.7
Toxic nodule	10	9.1
Toxic diffuse (graves)	9	8.2
Malignant	7	6.4
Lobe of thyroid involved		
All	44	40
Right lobe and Isthmus	13	11.8
Left lobe and Isthmus	14	12.7
Right lobe only	15	13.6
Left lobe only	8	7.3
Both lobes	14	12.7
Isthmus only	2	1.8
WHO Grade of goitre		
1a	10	9.1
1b	4	3.6
2	89	80.9
3	7	6.4
Gross appearance of goiter		
Not Giant (WHO grade 1 and 2)	103	93.6
Giant (WHO grade 3)	7	6.4

Table 4
Frequency of vocal cords palsy and side involved among goitre participants

Variables	Participant		
Vocal cords finding	Frequency	(n=110)	(%)
Normal	105		95.5
Palsy	5		4.5
Total	110		100
Side of palsy	Frequency	(n=5)	(%)
Left	3		60
Right	2		40
Bilateral	0		0
Total	5		100

Table 5
Pattern of vocal cord paralysis on flexible fibre-optic laryngoscopy in goitre patient seen in Ilorin

	Participants (n=5)	
Side of palsy	Frequency	(%)
Left Paramedian	3	60
Left Cadaveric	0	0
Right Paramedian	2	40
Right Cadaveric	0	0
Bilateral	0	0
Total	5	100

Table 6
Distribution of participants according to fine needle cytological diagnosis goitre

	Participants	
FNAC	Frequency (n=110)	(%)
Benign	102	92.9
Malignant	8	7.3
Total	110	100

Figure 2
Bar chart showing frequency of symptoms presented by goitre participants

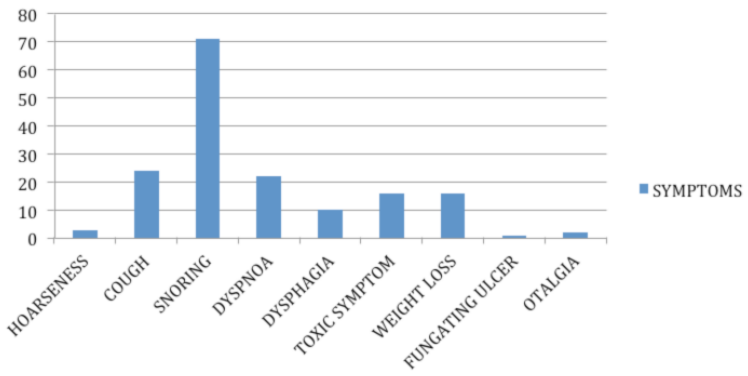


Table 7
Cross-tabulation of W.H.O grade of goitre and vocal cord finding on flexible fibre-optic laryngoscopic examination of goitre subjects

W.H.O Grade	Participants		
	Normal	Palsy	Total
	n (%)	n(%)	n(%)
1a	10(100)	0(0)	10(100)
1b	4(100)	0(0)	4(100)
2	87(97.8)	2(2.2)	89(100)
3	4(57.1)	3(42.9)	7(100)
Total	105(95.5)	5(4.5)	110(100)
Size of goitre			
Non giant			
(WHO grade 1 and 2)	101(98%)	2(1.9)	103(100%)
Giant (WHO grade 3)	4(57.1)	3(42.9)	7(100)
Total	105(95.5)	5(4.5)	110(100)

Table 8
Distribution of participants with vocal cord palsy by clinical type of goitre

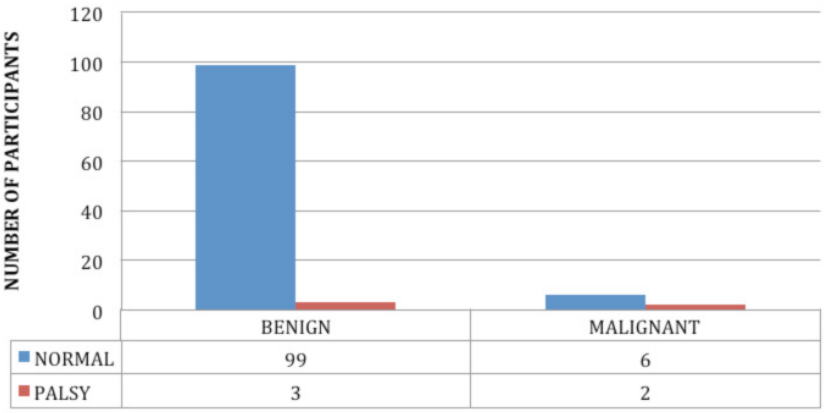
	Participants	
Type	(n=5)	(%)
Simple multinodular	3	60
Simple diffuse	0	0
Toxic nodule	1	20
Toxic diffuse (graves)	0	0
Malignant	1	20

Table 9
Comparison of the prevalence of pre-operative vocal cord in benign and malignant goitre patient seen in Ilorin

Vocal cords	Benign	Malignant
	n(%)	n(%)
Normal	99 (97.1)	6(75)
Palsy	3(2.9)	2(25)
Total	102(100)	8(100)

Figure 3

Bar chart showing the relative prevalence of vocal cord palsy in benign and malignant goitre



Pictures

Fig. I

Fig. II

Anterior view of one of the male participant seen with giant goitre, WHO grade III. This patient was followed up to surgery. Picture in Figure II showed the post- thyroidectomy specimen which weighed 400 gm. This participant had pre-operative left vocal cord paralysis. Fine needle aspiration cytology was benign.

Fig.III.
Lateral view of the participant in Fig. I

Fig.VI
Chemical bath endoscopy sterilization unit.

Fig.V: A male goitre participant being examine with a flexible fibre-optic

Fig. VI:75 year old female goitre participant

Out of the 110 participants seen, 81(73.6%) participants had simple multi-nodular goitre, 3(2.7%) had simple diffuse goitre, 10(9.1%) had toxic nodular goitre, 9 (8.2%) had toxic diffuse and 7(6.4%) had clinically malignant goitre. (Table 3).

Goitre involved all the lobes of the thyroid gland in most of the participants 44(40%), followed by right lobe only 15(13.6%). Left lobe and the isthmus involvement 14(12.7%) and both lobes 14(12.7%) involvement occurred with the same frequency, while the involvement of the left lobe or isthmus only was seen in 8(7.3%) and 2(1.8%) respectively. (Table 3)

Out of the 110 subjects seen, WHO grade 2 type of goitre constituted the most common 89(80.9%). Followed by grade 1a 10(9.1%); grade 3, 7(6.4) and 1b, 4(3.6%). Seven 7(6.4%) appeared giant. (Tables 3) Five (5) out of the 110 participants (4.5%) had demonstrable vocal cord palsy on flexible fibre-optic laryngoscopy. (Table 4)

Unilateral palsy was the only type of palsy seen in this study. Left vocal cord palsy constituted. 60% (3), while right palsy was seen in 40% of participants. (Table 4)

Position of the paralysed vocal cord was found to be para-median in all cases. (Table 5)

Majority of the participant 102(92.9) had a benign thyroid disease as demonstrated by the pre-operative fine needle aspiration cytology. (Table 6)

Snoring was the most common symptom seen in 71(64.5%) participants, followed by dry cough and/or choking seen in 24(21.8%) of participants. Toxic symptoms and weight loss had similar pattern of occurrence 16(14.5%). Hoarseness was seen in 3(2.7%) of participants. Fungating ulcer of the skin overlying the goiter and otalgia were seen in 1(0.9%) and 2(1.8%) respectively. (Figure 2)

A cross tabulation of W.H.O grade of goitre with vocal cord findings on flexible fibre-optic laryngoscopy showed the highest frequency of palsy in participants with goitre grade 3; 3(42.9%), while no palsy was found among participants with goitre grade 1a and 1b. (Table 7)

Simple multi-nodular goitre was the most common type of goitre among the palsy group as it was in the general population of participants. (Table 8)

The prevalence of vocal cord paralysis found in benign goitre is 2.9%, while the prevalence is 25% in malignant goitre. (Table 10).

DISCUSSION

The study noted a significant female preponderance in the study population (female: male ratio, 4.5:1), which was similar to the female gender preponderance, reported in earlier studies done in Ilorin, 13,14 and the experience of Afolabi *et al*. in Ibadan (6:1), (15) Edino *et al*. in Kano (2.5:1) (16) and similar studies done in other Africa sub-region (4.7:1). The findings in this study may be explained by the fact that the female gender are more predisposed to goitre because of their relative physiological deficiency of thyroid hormone occasioned by increased metabolic demand during menstruation, pregnancy and lactation leading to a goitre promoting negative feedback. This findings was corroborated by other studies done in Ethiopia where 40% of females reported rapid growth of goitre during late pregnancy and lactation (17).

The age group 31-60 years constituted almost half of the population with age group (41- 50 year) accounting for the largest population of patient (over a quarter). The observed concentration of participants in the working age group 41-50 years might be attributed to the relative economic strength of the working class, which is a factor that affects hospital presentation in a country where patients are responsible for their health care bills. A similar study in Northern Nigeria reported a mean age of 38.8 years (16) while studies in Asia (17) and America (19) recorded a mean age of 37 and 48.3 years respectively.

The findings of more than 60% of participants population belonging to the low socioeconomic class (SEC IV and V) is in keeping with some other studies done in the West African sub-region (17). The socioeconomic classification adopted for this study

was that of Oyedeji (20) as modified by Ogunlesi (21). These works used the educational and social status of individuals and parents to determine the social class of the participants. Poverty and poor awareness of goitre preventing food supplement among the low socio-economic class may be responsible for this finding. SEC III was the second most common in this study, perhaps because this group of people can afford the cost of treatment in public hospitals. In a country like Nigeria where Hospital bills are paid by individual patients (out of pocket); only those that can afford cost of healthcare services go to hospital. Others seek the services of quarks or traditional healers as alternative. A large majority of participants in SEC III seen in this study were teachers, this findings further stresses the need for meticulous effort by the surgeon to prevent vocal cord injury in all goitre patients particularly those group of patients whose means of livelihood depends on their voice. Further, In this study, all-lobe involvement was found with higher association with vocal cord palsy, 2(40%); all of which were left unilateral palsy. This finding might be explained by the increased risk of nerve compression with all lobe goitre and higher susceptibility of the left recurrent laryngeal nerve to compression because of its longer course. This finding is lower than the 70% bilateral lobe involvement seen in a study in Ethiopia (17).

Participants in this study presented relatively earlier (mean duration of two years) compared with a mean duration of illness of 8.8 years recorded in a similar study in another African sub-region (23). This may not be unconnected to the fact that there is relatively heightened health awareness among Nigerian population than their counterparts in other African countries (17). Cosmetic disfigurement and respiratory symptoms were the leading causes of hospital visit among goitre subjects in a study in North East Africa (17). Similarly, in one of the earlier studies in Ilorin, Olatoke found cosmetic disfigurement as the major reason for hospital presentation and demand for surgery among goitre patients (14). He attributed early presentation to heightened health awareness in the society about the amenability of goitre to orthodox medicine. Most of the participants included in this study had a goitre most of which were noticeable; even though, the findings of early presentation defers from some report of a general pattern of late presentation among patients with head and neck tumours in the developing country (22-25).

Simple multinodular goitre is found to be very common by many studies in Africa (13, 14, 26, 27), Asia, Middle East, Europe and America (15,19,28-30) accounting for 45- 80%. The figure of 81(73.6%) recorded in this study is consistent with studies from other parts of Nigeria (49.3%) (31). A community based study in Oyo, Nigeria found WHO grade IA (36.7%) and IB (35.7%) as the most common size of goitre at presentation (27). Grades II and III accounted for 27.3% and 0.2% respectively (27). While Adesunkanmi *et al.* (26) found a predominance of grade IA and IB (62%) among women attending antenatal clinic. These findings differ from that reported in this study where majority, 80.9% of the participants had W.H.O grade-II goitre size at the time of examination. The difference might be explained by the community-based nature of the study in Oyo; bearing in mind that community based studies catches patients earlier removing the time lag before hospital presentation, which often account for disease progression to a higher grade. Moreover, Adesunkanmi's study focused on a female population to whom cosmetic appearance is of great concern.

The finding of benign goitre as the most common cytopathological pattern in this study, 102 (92.9%) is consistent with the findings by Rahman (98%) 13 and Olatoke (83%) (14) in earlier studies in Ilorin. And similar studies in America (94.2%) (18) and Kano, Nigeria (96.2%) (16). However, a study in Maiduguri recorded 73.9% for benign tumours (32), which is less. The finding in this study may be explained by the fact that most thyroid swellings result from hormonal insult.

Flexible fibre-optic laryngoscopy detected vocal cord palsy in 4.5 % of subjects seen during this study with a palsy rate of 2.9% and 25% in benign and malignant goitre respectively. In a prospective flexible fibre-optic laryngoscopy study of 365 patients in Boston, United States of America; Randolph19 found vocal cord palsy in 0.3% of benign goitre and 70% of malignant goitre cases. A similar study of 1156 benign goitre patients in Europe by Holl-Allen32reported incidence of vocal cord palsy of 0.69%. While a retrospective study of 2321 goitre patient in the same continent reported vocal cord palsy in 0.9% and 8% of benign and malignant goitres respectively (16). The variation in the findings of these workers may be due to the difference in sample size as well as size of the goitre. However, the findings in this study is closer to that reported in a study of 186 patients in south east Asia (Taiwan) where 4.3% and 9.2% vocal cord palsy rate was found in benign and malignant thyroid disease respectively (34); even though, there was no significant association between vocal cord paralysis and malignancy. In the European study, (29,33) mechanism suggested for the production of vocal cord palsy in benign goitre included compression of the RLN and or its blood supply between the goitre mass and the cervical spine or the trachea; stretching of the nerve and peri-nodular inflammation producing minute artery thrombosis and fibrosis involving the nerve or direct involvement of the nerve in thyroiditis.

No case of bilateral palsy was seen in this series. However, left sided unilateral palsy was the most common 60%. This is at variance with studies in Europe where right-sided palsy constituted 69% of cases. Majority of subjects seen with paralysis had no

symptom. This may be so, given the unilateral nature of the vocal cord palsy with gradual progression of disease, allowing for compensatory movement to be developed by the contra lateral normal cord.

In a study of indirect laryngoscopy, Olaosun in Oshogbo reported pre-operative vocal cord assessment of goitre patients as the most common, 46.5%, indication for indirect laryngoscopy (35). He reported vocal cord paralysis in 1(5%) of the 20 patients with goitre and that same patient was said to have presented with an on-going sore throat at that period (34). No cytological classification or laterality of the lesion was given. Scientific literature is replete with aetio-pathological data of vocal cord palsy in western population; there is little information on pre-operative flexible fibre optic examination of vocal cords in Nigeria mainly because the instrument is not readily available. Our finding suggests suitability of flexible laryngoscope as a vocal cord visualisation technique.

In this study, visualisation of other parts of the larynx showed that pooling of saliva in the puriform sinus was a constant laryngeal examination finding seen in all patients with vocal cord palsy, there was a significant statistical association with $p< 0.001$. The base of the tongue and the valleculae were found to be normal in both palsy and normal cases.

In this study, snoring is the most common symptom among goitre subjects, occurring in 64.5% of participants with goitre. This may be due to pressure on the airway by the goitre mass, which were most commonly WHO grade 2 at the time patient presents to the hospital. The enlarged thyroid gland exerts a simple loading effect on the upper airway, particularly when the subject is supine during sleep (36). More so, a very large goitre can obstruct venous return from the head and neck region leading to oedema of the soft palate and pharynx, enlargement of upper airway structures and reduced airway patency (36). Additionally, the enlarged goitre impairs the function of muscles attached to the hyoid bone, the anterior movement of which increases the patency of the hypopharynx and reduces airway resistance (36).

There was a statistically significant association between hoarseness and vocal cord paralysis. (P-value was < 0.001, fisher exact test < 0.001). While fungating ulcer of the skin overlying the goitre was seen with a statistically significant association with malignant goitre (P-value <0.001, fisher exact test = 0.045). Paramedian position of the paralysed cord was seen in all the cases with vocal cord paralysis giving an impression of pathology involving only the recurrent laryngeal nerve with a sparing of the superior laryngeal nerve thus, leavings the external laryngeal muscle active and functional.

All the patients who had palsy had thyroidectomy within the study period and were seen at the immediate postoperative period; findings were largely the same. However, hospital stay was too short to draw any conclusion regarding post-operative recovery of vocal cord palsy. While the two participants with malignant thyroid disease (out of the five diagnosed with vocal cord palsy) were referred to other centres for radiotherapy, the other three were subsequently lost to follow up.

Generally, this study focused on patients referred to ENT department for pre-operative vocal cord assessment. Many of the participants could not make the operation list within the study period because of financial constraints and other factors causing delay in the final procurement of surgery. Besides, thyroidectomy waiting list in our hospital is usually long; due to the endemic goitre zone the hospital serves (5) and incessant interruptions of surgical services by industrial strike actions by health workers in the country.

Endoscopy is an invaluable tool for several surgical applications. The flexible fibre-optic scope used in this study utilizes a cable device containing an array of optical fibres to transmit light from its proximal to its distal end and an image from its distal to its proximal eyepiece for direct observation. One of the limitations was narrow field of view, which could have been improved by connecting an image-capturing monitor to the eyepiece for magnification. Another primary disadvantage of flexible fibre-optic laryngoscope is the limited light transmission through the fibre-optic array causing suboptimal image resolution and relative optical distortion. This could have been surmounted by using 90-degrees or 70-degrees rigid Hopkins rod, which has the advantage of producing a higher quality image adequate for the identification of subtle laryngeal anomaly (12,37). Further, the high intensity light transmission capacity of the rigid scope allows the use of stroboscope and high speed imaging technique (12,37). Moreover, time constraint prevented inclusion of data on intra-operative findings, histology report and post-operative follow up of all the subjects to document any recovery of vocal cord palsy as seen in previous studies (29, 32, 33). These limitations, may inform future research direction.

In any case, patient found with pre-operative vocal cord palsy should be operated by experienced surgeon in order to improve the chance of post-operative recovery and minimize risk of damage to the contralateral normal nerve. Voice therapy, neuro-tropic drugs and teflon injections may be prescribed as indicated in cases where vocal cord palsy persists post-operatively.

CONCLUSION AND RECOMMENDATION

Vocal cord paralysis is a common complication of goitre. It may occur in either benign or malignant goitre, though more common in malignant cases.

It is not all patients with pre-operative vocal cord palsy that will manifest hoarseness in the pre-operative period. Even when present, goitre patients in developing countries may not readily volunteer useful information about subtle symptoms (until it is worse), as they are unaware of the implication. Hence,surgeons should specifically probe for those symptoms during pre-operative reviews. Moreover, no goitre patient (benign or malignant) should be operated without a pre-operative vocal cord assessment.

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ETHICAL STANDARDS

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional guidelines on human experimentation (University of Ilorin Teaching Hospital Ethical committee) and with the Helsinki Declaration of 1975, as revised in 2008.

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