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Second Branchial Cleft Anomalies

Endoscopic Experience and Perception

Highlights

3d Evaluation of Soft Tissue Changes

Descriptive Study of Benign Vocal Cord

Discovering Thoughts, Inventing Future

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Incidence and Outcome of Second Brachial Cleft Anomalies: A Three Years Experience and Appreciation

By Delwar AHM

Abstract- *Background:* Second branchial cleft anomalies are remarkable of all other inborn errors of branchial apparatus. As a congenital, it may be presented at birth but usually manifests in early teenagers and young adults. Like all other inborn errors, it is better to correct earlier before suffering from any complications.

Methods: It is a cohort retrospective study of 15 cases in the Department of Otolaryngology and Head-Neck Surgery, Cumilla Medical College, and Cumilla Medical Centre, Bangladesh, from 01 July 2016 to 31 June 2019.

Results: Incidence of anomalies among routine ENT operations was 0.21%. Of 15, the cyst was 04(26.27%), sinus was 10(66.66%), the fistula was 1(6.67%), children were 09(60%), the adult was 6(40%), and young adult and an early teenager were 07(46.66%), male was 11(75.33%), and females were 04(26.27%), bilateral were 2(13.33%), unilateral was 13(86.67%) in which right was 10(76.33%), and left was 03(23.08%), painful cyst with abscess was 01(6.67%), the painless cyst was 03(20%), sinus with the mucoid fluid discharge was 07(46.68%), painful sinus with mucopurulent discharge and skin-excoriation was 03(20%), painful fistula with mucopurulent discharge and skin-excoriation was 01(6.67%), post-operative wound infection was 2(13.33%). Recurrence and the branchio-oto-renal syndrome were absent in our study.

Keywords: *second brachial cleft anomalies (SBCA), cyst, sinus, fistula.*

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Incidence and Outcome of Second Brachial Cleft Anomalies: A Three Years Experience and Appreciation

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Abstract- Background: Second branchial cleft anomalies are remarkable of all other inborn errors of branchial apparatus. As a congenital, it may be presented at birth but usually manifests in early teenagers and young adults. Like all other inborn errors, it is better to correct earlier before suffering from any complications.

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Conclusion: Surgery is the treatment modalities of second branchial cleft anomalies. Infected cases should treated first medically to control the infection then make a plan for operation.

Keywords: second brachial cleft anomalies (SBCA), cyst, sinus, fistula.

I. Introduction

A child, teenagers or young adult with a congenital cyst, or sinus, or fistula in the head or neck region is the occasional patient for the ENT Surgeon. Second branchial cleft anomalies(SBCA) is a sporadic disease entity but 95% of all branchial abnormalities.[1] In the fourth week of an embryo, surrounding the primitive pharynx or cephalic part of the foregut, six pairs of condensation appear in the form of branchial or visceral arches. There is depression both inside and outside of the arches in which inside line by ectoderm is known as a branchial or pharyngeal pouch and outside by ectoderm is known as branchial or pharyngeal cleft. Between the two is the cleft membrane or mesoderm of the branchial arch with internally lined by columnar and outside with squamous epithelium. Each branchial arch has a central plate of cartilage, which gives rise to bone, a muscle mass, a nerve, supply to the same derivatives of it, and an artery. The Fifth arch disappears, and the sixth arch is rudimentary. The brachial cyst is a persistent cervical sinus due to the fusion of overgrowing second branchial arch with the sixth arch. Usually this sinus disappears. If it persists, accumulation of the secretion from the appendage of the ectodermal lining of sweat and sebaceous glands occurs inside the sinus and gives rise to a cystic swelling called a branchial cyst. Sometimes the second arch fails to fuse with the sixth arch and gives rise to brachial sinus and fistula.[2] There are some other theories to form the cyst and sinus, which are branchial apparatus, hypopharyngeal and inclusion theory. The well accepted one is the brachial anomalies result from incomplete involution of the brachial apparatus. The Second branchial arch forms the epidermis of the dorsal pinna and upper part of the neck. The branchial cyst usually lies superficial to the structures developed from the second and third arches, which are the lesser cornu of the hyoid bone, posterior belly of digastrics muscles, facial nerve, and external carotid artery. Another theory describes that the mesoderm forms the facial muscles and the body of the hyoid bone, and the endodermal elements from the root of the tongue, the foramen caecum, the thyroid stalk, and the tonsil. The second branchial cleft sits immediately caudal to these structures, and it is the persistence of this cleft that leads to the formation of the second branchial cyst, and sinus.[3] SBCA may form the part of the branchio-oto-renal syndrome.[4,5] The second branchial cyst may be infected to an abscess, consequently automatically bursting or giving inadvertent incision to draining the pus leading to the formation of a sinus or fistula.[1] There is some differential diagnoses related to SBCA like a tubercular cold abscess, cervical dermoid, plunging ranula, cystic hygroma, carotid body tumor, cervical lymphadenopathy, and submandibular salivary gland swelling. In 1929 Baily H. classify the SBCA into four types, which provide the information for clinical diagnosis and surgical planning of unusually placed

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cyst, sinus, or fistula: 1. Deep to the platysma, anterior to sternocleidomastoid-. 2. Abutting the internal carotid artery adherent to internal jugular vein (most common). 3. Extending between internal and external carotid arteries. 4. Abutting pharyngeal wall and potentially extending superiorly to the skull base.[6] The external opening of the sinus and fistula may present as a congenital opening in the junction of lower one third and upper two-third anterior to sternocleidomastoid muscle directed proximally and medially to pass the carotid fork extending to communicate with the pharynx through the palatine tonsil to form a fistula.[7] Usually, the sinus or fistula tract leaks clear mucous secretion, sometimes they are infected, and consequently, the formation of an abscess occurs in early infancy, requires intravenous antibiotic and surgical drainage.[8] The SBCA presented unilaterally, sometimes may be presented bilaterally.[9] As a rule with SBCA, the diagnosis is evident, and no further investigations are required. But some cases of studies showed that the reliability of clinical examination was 50-60%.[10] The surgical excision of the complete tract is the option of the treatment of SBCA. Surgical anatomy of the branchial apparatus should understand clearly as the internal jugular vein, hypoglossal nerve, facial nerve, and parotid gland closely related to the tract.

The study finds out relative incidence, frequency, and presentation of SBCA, and the best management of it.

II. Methods and Materials

It is a cohort retrospective study of 15 cases in the Department of Otolaryngology and Head-Neck Surgery, Cumilla Medical College, and Cumilla Medical Centre (PVT) LTD, which is a concern clinic of Central Medical College, Cumilla, Bangladesh from 01 July 2016 to 31 June 2019. During three years period, 7099 routine ENT operations were performed. Among 15, the cyst was 04; sinus was ten, and fistula was 01. All 15 patients were clinically diagnosed as SBCA and confirmed by history, examination, and investigation such as USG of the neck, and renal system, sinogram, FNAC, and MRI whichever were need. The following data collected about the patients: Age, sex, side, presenting features, post-operative follow-up, and complications. Statistical software SAS used to calculate all data. All cases of neck swelling diagnosed as SBCA included in the study. All other cases present with neck swelling like a tubercular cold abscess, cervical dermoid, plunging ranula, cystic hygroma, carotid body tumor, cervical lymphadenopathy, and submandibular salivary gland swelling excluded from the study. Branchio-oto-renal syndrome was absent in our study.

III. Results

Incidence of SBCA, out of routine ENT operations, was 0.21% (Chart-1). Of 15, cyst was 4(26.67%), sinus 10(66.66%), fistula 01(6.67%), male were 11(73.33%), and females were 4(26.67%) (Figure-1). Considering from 15, unilateral was 13(86.67%) in which right was 10(76.92%), and left 03(23.08%), and bilateral was 02(13.33%) (Figure-2). We studied the age of two categories. Firstly, children (00-18 years) were 09(60%), and adults (19 years and above) were 06(40%). Secondly, children below early teenage 00-10 years were 04(26.67%), early teenage, and young adult 11-30 years were 07(46.66%), and 31years, and above were 04(26.67%) whereas the lowest age was 05 years and highest was 55 years, mean age was 21.13 years and the standard deviation was 19.13 (Figure-3). Presenting features exhibited, painful cyst with abscess formation was 01(6.67%), painless cyst 03(20%), sinus with the mucoid discharge was 07(46.66%), sinus with mucopurulent discharge and skin excoriation 03(20%), and fistula with mucopurulent discharge and skin excoriation was 01(6.67) (Figure-4). Regarding investigations, ultrasonography of neck and the renal system performed all 15(100%) cases, sinogram 11(73.33%) cases, FNAC 04(26.67%) cases, and MRI 02(13.33%) bilateral cases (Figure-5). CT scans in children wasn't doing due to more exposure to ionizing radiation. All cases treated surgically through stepladder incision externally and one cases complete fistula both externally excision of fistulas tract, and internally tonsillectomy did per orally (Figure-6). 02(13.33%) cases suffered wound infection after surgery (Figure-5). Post-operative recurrence was absent in our study.

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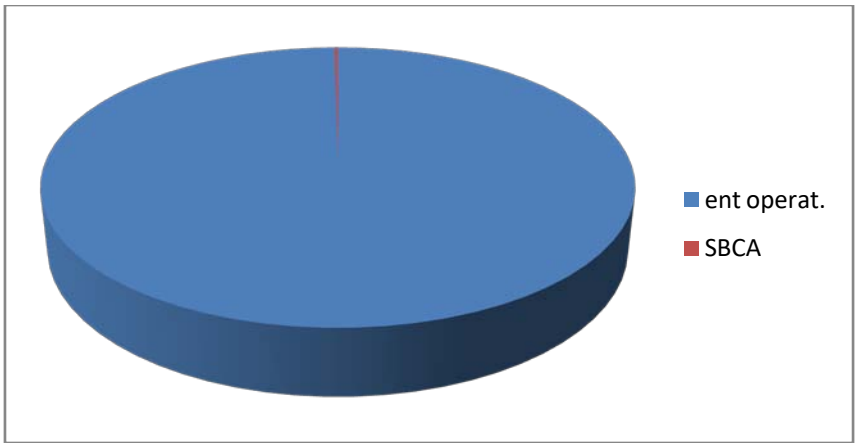


Chart-1: ENT operations and SBCA (n-7099;SBCA-15:0.21%)

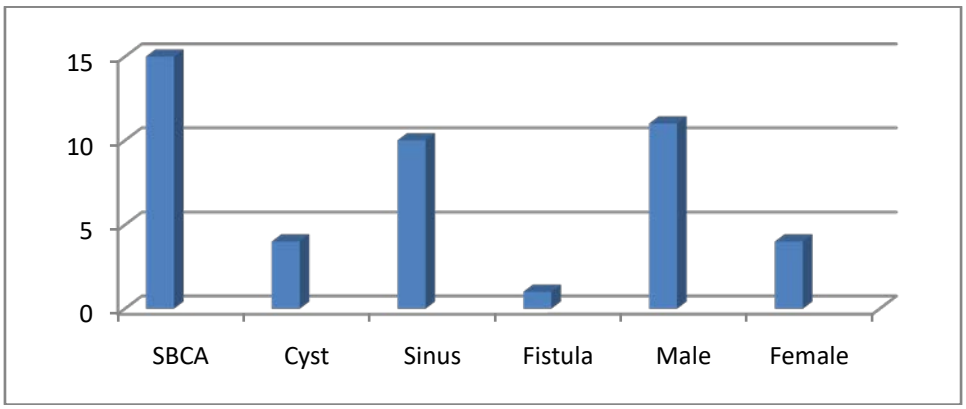


Figure-1: Types & Gender epediomology:[n-15;cyst-4(26.67%):sinus-10(66.66%):fistula-1(6.67%):male-11(73.33%):female-4(26.67%)]

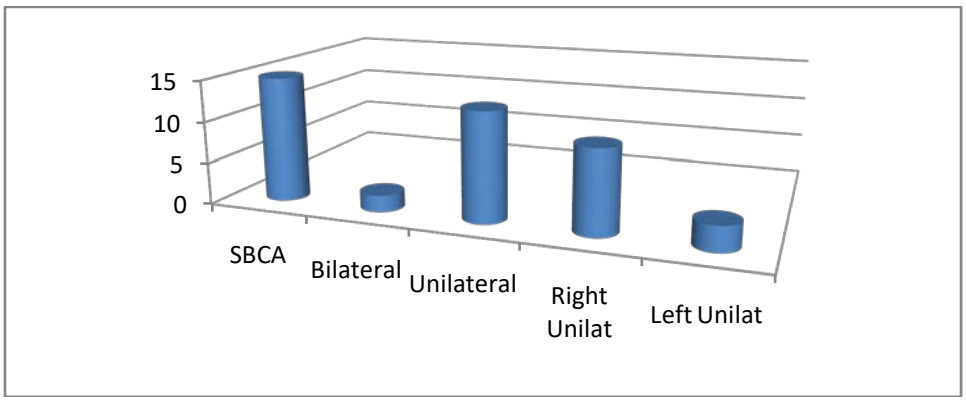


Figure-2: Side and Laterality: [n-15;bilateral-2(13.33%):Unilateral-13(86.67%):Right unilateral-10(76.92%): Left unilateral-3(23.08%)]

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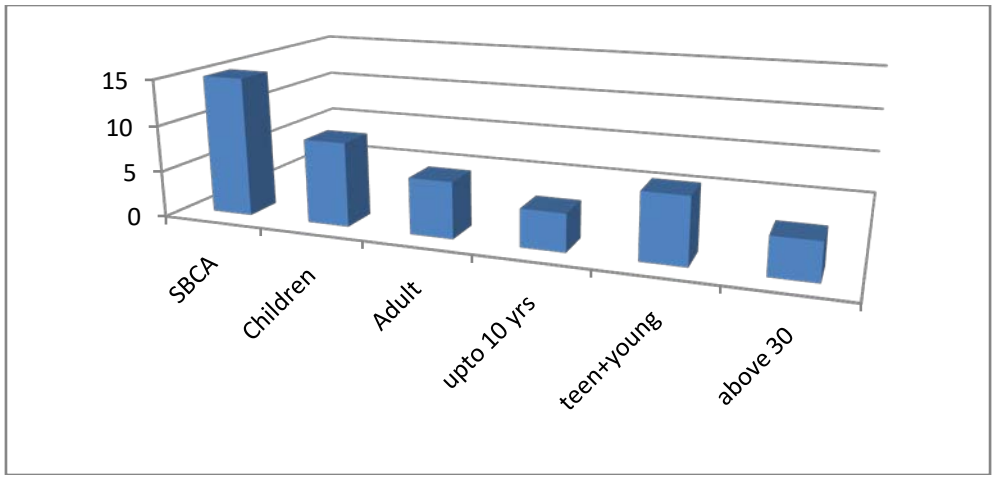


Figure-3: Age allocation:[n-15;Children-9(60%):Adult-6(40%):Children(0-10)yrs-4(26.67%):Early teen & young adult(11-30)yrs-7(46.66%):Adult above 30yrs-4(26.67%)]

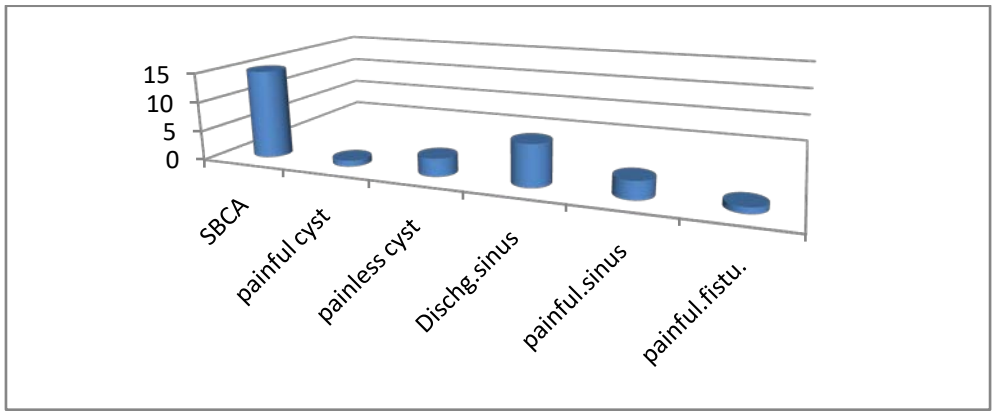


Figure-4: Presenting features:[n-15;painful cyst with abscess-1(6.67%):painless cyst-3(20%):painless sinus with mucoid discharge-7(46.66%):painful sinus -3(20%):painful fistula-1(6.67%)]

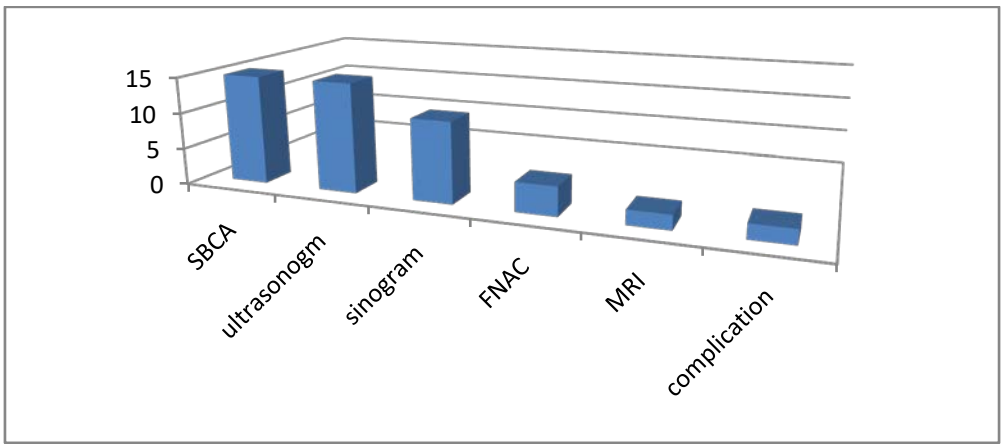


Figure-5: Investigation & complication:[n-15;ultrasonogram-15(100%):sinogram-11(73.33%):FNAC-4(26.67%):MRI-2(13.33%):complication-2(13.33%)]

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Figure-6: Picture of stepladder incision

IV. Discussion

Branchial apparatus abnormalities were well-known from the eighteenth century. Ascherson first described the branchial cyst in 1832 and established the most common theory that the formation of the branchial cleft is the defective obliteration of branchial apparatus.[11] All were near to one another. Other's are cervical sinus theory, hypopharyngeal theory and inclusion theory.[12]

The incidence of SBCA was 0.21% in routine operation. In the two institutions, we found only 15 patients in three years, which supported by Mitroi M. et al. series, they found 23 patients in six years, Kalra VK. et al. also held up our study, showed 94 cases for ten years.[13,14]

Regarding the type of SBCA sinus was the highest 66.66% and the cyst was the second most common type, 26.67% in our literature, which supported by Choi SS. et al., established maximum incidence of sinus followed by fistula.[12] Whereas Telander RL. et al. were against our series; they reported 75% was cyst followed by fistula and sinus.[15]

Concerning the age, mean age was 21.13 years in our report, which was opposite to Karabulut R. et al., they displayed the mean age was 5.30.[16] Choi SS. et al. series kept up our report, they exhibited the mean age was 18.35 years.[12] Early teenager and young adult were 46.66% in our study, supported by Keith GT. et al.[3] Mitroi M. et al. showed most cases were in 2nd and 3rd decade, replicated our study.[13]

Gender epidemiology showed in our series of males (73.33%) were near three times more than females (26.67%), supported Simpson RA. et al. reported male, females ratio was 3:1.[17] Faerber EN. et al. study revealed that there was no gender predilection.[18]

In our series, right unilateral was 76.92%, supported Ford GR. et al., they reported 60% on the right side, Kalra VK. also showed right preponderance was 65.95%.[19,14] Agaton-Bonilla FC. et al. showed bilateral SBCA were 1-30% that complemented our study that was 13.33%.[20]

Regarding presenting features, in our study, painful cyst with abscess was 6.67%, painful sinus with the muco-purulent discharge 20%, painful fistula with secretion 6.67%, the painless sinus with mucous production 46.66%, the painless cyst was 20%, total infected was 33.34%, and uninfected was 76.66%, supported Ford GR. et al. series displayed repeated discharge from the opening, and infection of cervical mass.[19] Som P. also held up our study, reported that small mass or opening usually one side of neck rarely bilateral, painless and painful if inflammation.[21]

About investigations, ultrasonography did in 100% of our cases, which carried out Bruneton JN. et al. study who described that with modern high-resolution transducers, one could evaluate the internal architecture of lesion.[22] Sinogram did 73.33%(11) of cases, which kept up Celis I. et al. series which reported pre-operative sonogram helps define the anatomy of a sinus or fistula.[23] FNAC did our 26.67%(4) cases that Benson MT. et al. reported the confirmation of cyst by pathological characteristics, usually cyst filled with turbid, yellowish fluid that may contain cholesterol crystal, thin-walled, lined by stratified squamous epithelium, sometimes columnar respiratory epithelium.[24] MRI did in 13.33%(2) cases, Miller MB. Reported that MRI imaging better depicts the extent of SBCA into tissue, which allows accurate pre-operative surgery planning.[25]

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Treatment of SBCA is surgical excision on the uninfected neck; if infection, after control of it, surgery should be planned, supported Daoud FS. Series.[26] Several surgical approaches described by Mandell DL. and Agaton-Bonilla FC. stepladder incision or wide cervicotomy incision known as hockey stick incision to excision of SBCA.[27,20] We practiced stepladder incision, and in one case, complete fistula, externally fistulous tract, and tonsillectomy did per-orally. T0 proper delineating the course of the sinus or fistula we used in Methylene blue, which practiced kalra VK. et al.[14] We followed-up the patient up to six months every monthly, recurrence didn't find out during the period, but Ford GR. And Prasad SC. et al. reported a 3% and 1.2% recurrence rate accordingly.[19,28]

Post-operative wound infection was 13.33% in our study, whereas Prasad SC. et al. represented 14.71% close to our series.[28] It was due to that one of the patient was diabetic and another one needful and un-lettered, and unaware about post-operative cleanliness and safety. We were admitted to the patients in the hospital for regular dressing, and start intravenous antibiotics, controlled diabetes, healed the wound without any eventful consequence.

V. Conclusion

Though sporadic, SBCA is one of the remarkable congenital anomalies of the head and neck region. Surgical excision of the tract is the aim of treatment due to the risk of repeated infection. Surgery can perform at any age. Care should take to identify and avoiding injury the vital structures like the lingual nerve, facial nerve, parotid gland, internal jugular vein, and hypoglossal nerve.

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A Descriptive Study of Benign Vocal Cord Lesions with Speech Prameters Operated with Microlaryngoscopy

By Dr. Tushar Govind Borade, Dr. Meena Vishwanath Kale
& Dr. Ninad Subhash Gaikwad

Abstract- *Background:* Humanity has appreciated the importance and power of the human voice. Voice disorders like benign, malignant lesions of vocal cord affect the voice quality and also can have a devastating effect on daily functioning and quality of life. These lesions can be diagnosed and treated with microlaryngoscopy. Micro-laryngoscopy is a procedure for visualization of a magnified view of the voicebox (larynx) with the help of a laryngoscope assisted with an operating microscope for precise laryngeal surgery. Speech parameters helps in voice quality assessment for vocal cord lesions.

Method: We have studied 30 cases of benign vocal cord lesion by simple random sampling for two years which got operated with microlaryngoscopic conventional surgery. Their pre and post-operative assessment is done with respect to speech parameters like Maximum Phonation Time, Voice Handicap Index and GRBAS Score. Clinical history and rigid Hopkins 70^0 also helped in diagnosing of benign vocal cord lesions.

Result: After conventional microlaryngeal surgery helps in improvement in MPT, VHI score, GRBAS Score post-operatively that of 3 months follow up. The effectiveness was seen more along with voice rest, corticosteroids and most important speech therapy.

Keywords: *benign vocal cord lesion, grbas score, maximum phonation time, speech therapy, microlaryngoscopy, voicebox, voice handicap index.*

GJMR-J Classification: *NLMC Code: WU 530*



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Result: After conventional microlaryngeal surgery helps in improvement in MPT, VHI score, GRBAS Score post-operatively that of 3 months follow up. The effectiveness was seen more along with voice rest, corticosteroids and most important speech therapy.

Conclusion: Clinical history, speech parameters and rigid Hopkins laryngoscopy helps in the diagnosis of benign vocal cord lesions. All above assess the postoperative effectiveness of microscopic conventional laryngeal surgery.

Keywords: benign vocal cord lesion, grbas score, maximum phonation time, speech therapy, microlaryngoscopy, voicebox, voice handicap index.

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I. Introduction

It is true that if eyes are mirrors of the soul, then surely voice is the loudspeaker. Human voice is extra-ordinary, complex and is integral to our personality. A clear, pleasing confident voice conveys the positive impression of an adequate personality.[1]

In 1854 Manual Garcia a Spanish singing teacher living in London was recognised as "Father of Laryngology" and first to report the visualisation of the larynx with mirrors and reflected sunlight.[2]

Before surgical microscope, the larynx was visualized using the laryngeal mirror which did not allow a complete examination. Hence with the advent of micro-laryngoscopy (ML-Scopy) the larynx is seen with the help of a direct laryngoscope and the view is magnified by using an operating microscope for diagnosis and surgery.

Kleinsasser introduced the use of the new design of laryngoscope in conjunction with the operating microscope in the early 1960s. He was a pioneer in the development of the technique for the treatment and examination of different laryngeal lesions.[3]

The development of micro-laryngoscopy has made precise microlaryngeal surgery possible and it has based on 3 basic principles are as follows[4]

1) Maximal preservation of healthy mucosa particularly on the free edge of the vocal folds
2) Minimal disruption of the superficial lamina propria layer and avoidance of any damage to the underlying vocal ligament
3) Preservation of the mucosal trigone at the anterior laryngeal commissure to avoid the formation of synechiae.

II. Methodology

A retrospective study of 30 patients with benign vocal cord lesions (BVCL) who have attended T.N.M.C. and B. Y. L. Nair Ch. tertiary care hospital from September 2014 to September 2016. Patients were selected by simple random sampling who satisfied the inclusion criteria. Following conventional MLScopy excision, patients were assessed with the speech

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parameter in the OPD after 7, 30 & 90 days. The data entered with appropriate statistical software. Informed and willing consent taken for ML-Scopy.

Microsoft office 2007 was used to make tables and graphs. Descriptive statistics like mean, percentages were used to interpret the data and conclude the results.

a) Inclusion Criteria

- Patients with age above 18 years with benign vocal cord lesions like polyp, nodule, cyst, vocal cord papilloma, Reinke's oedema not responding to medical and speech therapy for 2 weeks.

b) Exclusion Criteria

- Malignant lesions and patients not fit for general anaesthesia.

III. Aims and Objectives

1. To study the surgical management of benign vocal cord lesion with use of ML-Scopy and its outcome in terms of improvement in voice quality, resolution of lesion on Rigid Hopkins 70 degree scopy.
2. Improvement in voice quality will be assessed by maximum phonation time, improvement in score of GRBAS and voice handicap index.
3. To study and correlate effectiveness of ML-Scopy with respect to Demographic variation, Intra-operative findings & Post- operative follow up.

IV. Speech Assessment Parameters

a) Maximum Phonation Time:[5]

The time an individual can sustain a sung tone, a vowel sound (ah) produced on one deep breath, after having filled the lungs maximally. Selection Rationale: 1) The MPT is the best of 3 attempts at sustaining a vowel ("ah") without straining.
2) Quick and easy to administer
3) In practice since 40 years, non-invasive and requires no special equipment, other than a stopwatch.

Normally, adult males and females can sustain vowel ("ah") sounds for between 25-35 seconds and 15-25 seconds respectively. In general the MPT of less than 10 seconds is abnormal and interferes with daily life significantly. In cases of vocal dysfunction, the MPT is considerably reduced.

b) GRBAS Scale[6,7,8]

Hirano proposed the GRBAS scale a widely used by speech pathologists and laryngologists for the evaluation of voice quality. And also GRBAS for evaluating the hoarse voice: proposed by Japan Society of Logopedics and Phoniatrics

Evaluation: grading is a subjective perceptual evaluation
0: Non hoarse or normal 1: Slight 2: Moderate 3: Extreme

The five elements:

Grade (G): a description of the degree of hoarseness

Roughness (R): the perceptual irregularity of vocal fold vibrations, usually the result of a change in fundamental frequency or amplitude of vibration.

Breathiness (B): the assessment of air leakage through the glottis.

Aesthenic (A): voice denotes weakness and lack of power.

Strain (S): reflects a perception of vocal hyperfunction.

c) Vocal/Voice Handicap Index (VHI) (Developed by Jacobson et al 1997)[9,10]

Handicap is defined as, "a social, economic, or environmental disadvantage resulting from an impairment or disability." The VHI is a quality-of-life subjective questionnaire for self-evaluating voice disorders, which has excellent reliability and reproducibility. The VHI can also be useful as a component of measuring functional outcomes in behavioural, medical, and surgical treatments of voice disorder. The VHI is a 30 questionnaire (120-points total) to quantify the 10-item of each subscale of functional, emotional and physical impacts of a voice disorder problem.

Vocal pathologies can have different levels of handicap. Subjects were asked to read each item and circle one of five responses comprising an equal-appearing 5-point scale. The scale had the words anchoring 0: never, 1: almost never, 2: sometimes, 3: almost always, 4: always.

VHI is classified as

Mild: values of 0-30: mildly impaired voice

Moderate: values of 31-60: moderately impaired voice

Severe: values of 61-120: self-perception of voice as severe

d) Operative procedure

The Kleinsasser laryngoscope along with microscope of 400mm focal length was fixed with the help of Levy type of suspension apparatus on the chest. During this, pulse and ECG of the patient carefully recorded.

We have studied various cases of benign vocal cord lesions with ML-Scopy surgery without much damage to normal mucosa.

Preoperative speech therapy is advised to all patients to prepare for post-operative rehabilitation programme.[11]

Post operatively mainly treated with:

- Strict voice rest
- corticosteroids (Oral, nebulisation)
- antihistaminics
- steam inhalation
- post-op 1 week later: speech therapy.
- ceasation of addiction.

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After surgery follow up on 7 days, 1 month and 3 months in outpatient department and clinically assessed by

1) Hopkins rigid 70 degree scope
2) Speech parameter by MPT, GRBAS, VHI Scale.

V. Benign Vocal Cord Lesions (BVCL)

1) Vocal cord nodules: result from the voice misuse or abuse and in non-professional singers with poor singing technique.[12] It is chronic, commonly present as a pinkish, fusiform usually bilateral mucosal swelling of the membranous portion of the vocal folds.[13] These nodules are typically located slightly below the vocal fold free edge of the junction of the anterior and middle third of the glottis. Pathophysiologically a forceful vibration of the membranous vocal folds that translates into maximal shearing forces at the midpoint of the vocal ligament. Nodules are much less frequently seen in prepubertal males than in females.[14]

Delicate surgical intervention with resection of the nodule with utmost care of normal mucosa and superficial lamina propria layer of the vocal fold is done.[15] Bilateral nodules can be removed during the same session, but a trigone of healthy mucosa must be preserved to avoid vocal fold web formation.

2) Vocal cord Polyps: [12,14,15,16]

A vocal polyp is an inflammatory benign swelling of greater than 3 mm that arises from the free edge of the vocal fold.

Polyps are the most common cause of hoarseness, frequently seen in middle aged (25-45 years) smokers, males. Phonotrauma is an important while yelling or shouting at times of infective laryngitis or oesophageal reflux are aetiological factor. May be due to disruption to the vascular basement membrane, capillary proliferation, minute haemorrhage and fibrin exudation. Usually solitary, but can be bilateral.

Polyps are either sessile or pedunculated (Fig: 1A) and are treated by microsurgical excision (Fig: 1B) followed by intrachordal corticosteroids injection to avoid recurrance with post-operative medical management.

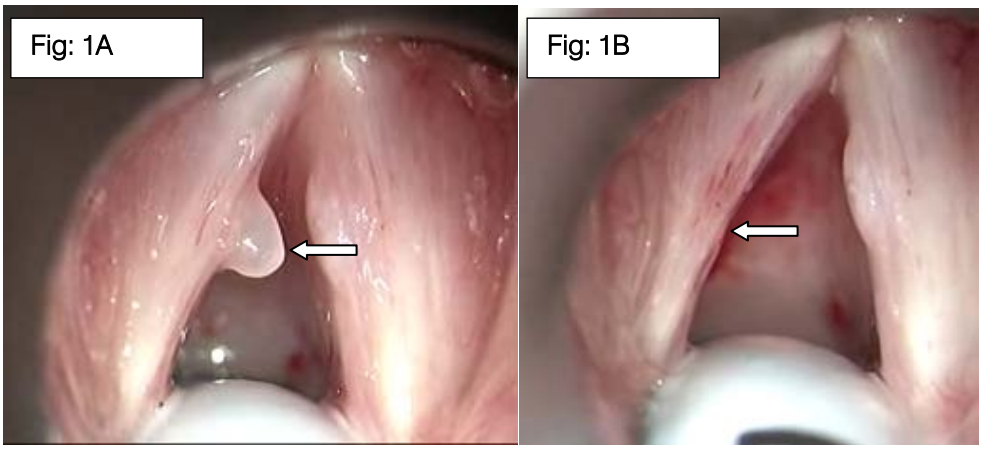


Fig. 1: ⇦ Microlaryngoscopy of left vocal cord sessile polyp
Fig. 1A: Preoperative
Fig. 1B: Postoperative

3) Reinke's Edema: [17,18,19,20,21]

Reinke's Oedema of vocal fold is essentially seen in smokers with voice abuse, leads to typical inflammatory and oedematous lesion.

It can be bilateral, asymmetrical change and more prominent on the superior and free edge of the vocal folds.

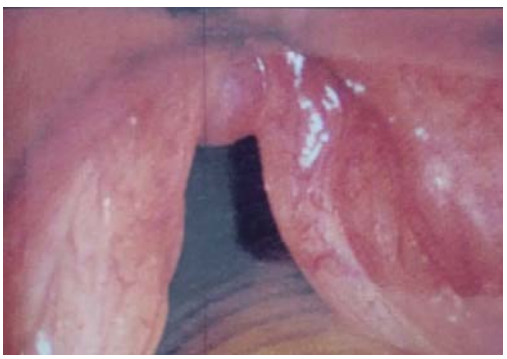


Fig. 2: Reinke's oedema of bilateral vocal cord

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In this surgery, the mucosa is dissected from the myxoid components of Reinke's oedema on top and from the vocal ligament underneath. Once the pseudomyxoma is fully resected, the mucosa of free edge is folded back onto the vocal ligament and fixed in position with fibrin glue for optimal return of voice.

4) Vocal cord cyst [15,16,22]

The cyst is usually unilateral and typically mucoid, fusiform lesion situated in the superficial lamina propria layer in free edge of vocal cord. Cyst results from cicatrical occlusion of a mucus gland duct.



Fig. 3: Left vocal cord cyst

A cyst can be approached via a lateral microflap incision made on the superior surface of the vocal fold away from its medial edge. The flap is then elevated from lateral to medial, the lesion excised and the flap replaced.

5) Vocal cord papilloma[23,24]

Frequently recurring and are due to the human papilloma virus (subtypes 6 and 11). They are single or multiple, friable and often found at areas of constriction in larynx. Where there is increased air turbulence, drying of mucosa can lead to change of ciliary to squamous epithelium.



Fig.4: Bilateral vocal cord papilloma

Surgical techniques for multiple papilloma include using injection of saline submucosally (hydrodissection) and excising the mucosa en-bloc with cold steel. This gives a lower recurrence rate than surface ablation.

6) Vocal cord haemangioma[25,26]

The incidence of laryngeal hemangioma in infants is 4-5% but rare in adults and when it is present in adults it is more prevalent in the male population. Mostly midportion vibratory edge of vocal folds are subjected to trauma from chronic over-talking, high volume talk, screaming or aggressive singing i.e. vocal abuse, cigarette smoking and laryngeal trauma such as in case of intubation blood vessels may tear with blood seeping into the vocal fold. Once the blood vessels heal due to thinner vessel walls, they tend to be more dilated and assume a tortuous form. If dilated vessels may become engorged during phonation with the risk of subsequent rupture leading to subepithelial hemorrhage.

Initially, conservative management with voice rest and steroids is recommended. Episodes of frequent development then need for surgical excision.

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VI. Results

- In our study, the maximum benign lesions were seen in age groups of 31 to 50 years (Table:1) i.e. 20(66.6%) cases with mean age of patients as per our study is 40.5 years. Where there is equal distribution among male and female for benign vocal cord lesion.

Table 1: Age and Sex distribution

Sr.No.	Age in years	No. of males	No of females	Total
1	21-30	1	2	3
2	31-40	5	7	12
3	41-50	4	4	8
4	51-60	4	1	5
5	>60	1	1	2
	TOTAL	15	15	30

- Even though equality seen among both sexes for BVCL but variability existed in each special lesion which explained as in Table: 2

Table 2: Sex distribution of BVCL

Sr.No.	Vocal cord lesions	Males	Females	Total No. of cases	Percentage
1	Nodules	6	8	14	46.66
2	Polyps	2	4	6	20
3	Haemangioma	1	1	2	6.66
4	Cyst	1	1	2	6.66
5	Papilloma	1	-	1	3.33
6	Chronic laryngitis with Reinke's oedema	4	1	5	16.66
	TOTAL	15	15	30	100

Majority of cases were found to have vocal cord nodules i.e. 14 cases (46.66%) and most commonly found in 8(26.6%) females, while incidence of Reinke's oedema was more in males (13.3%).

- Our study says; each patient of BVCL was suffered whether it was a small or large lesion. Most of the complaints were as follows (Table: 3)

Table 3: Distribution of Symptoms

Sr. no.	Symptoms	No of cases	Percentage
1	Change in voice/Hoarseness	26	86.66
2	Foreign body sensation in throat	22	73.33
3	Discomfort in throat	20	66.66
4	Inability to raise the voice	9	30
5	Fatigue of Voice	2	6.66

Change in the voice/Hoarseness of voice (86.66%) and foreign body sensation (73.33%) were the most common complaints given by patients of benign vocal cord lesion.

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❖ Most of the voice related occupations and person's habits (Table 4 and 5) can be responsible for change in sensitive vocal cord mucosa into benign lesions.

Table 4: Distribution according to occupation

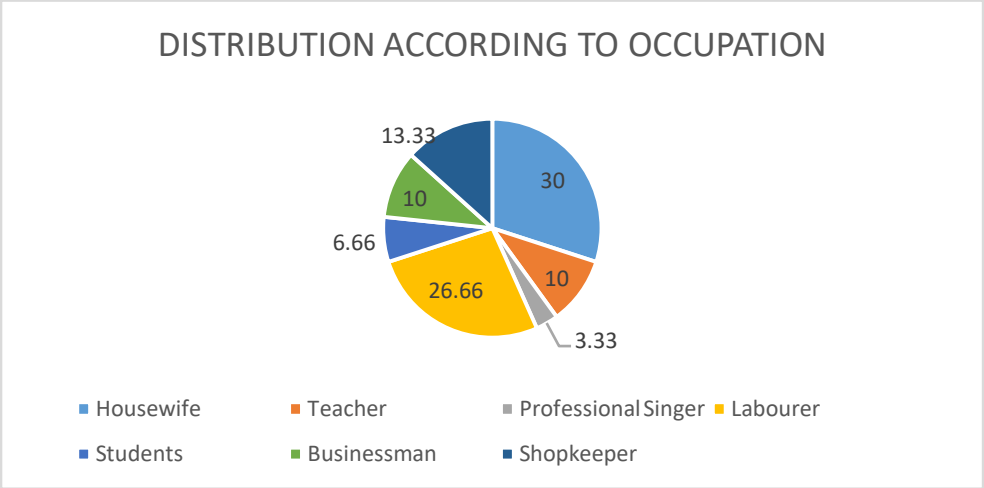


Table 5: Distribution of cases according to habits

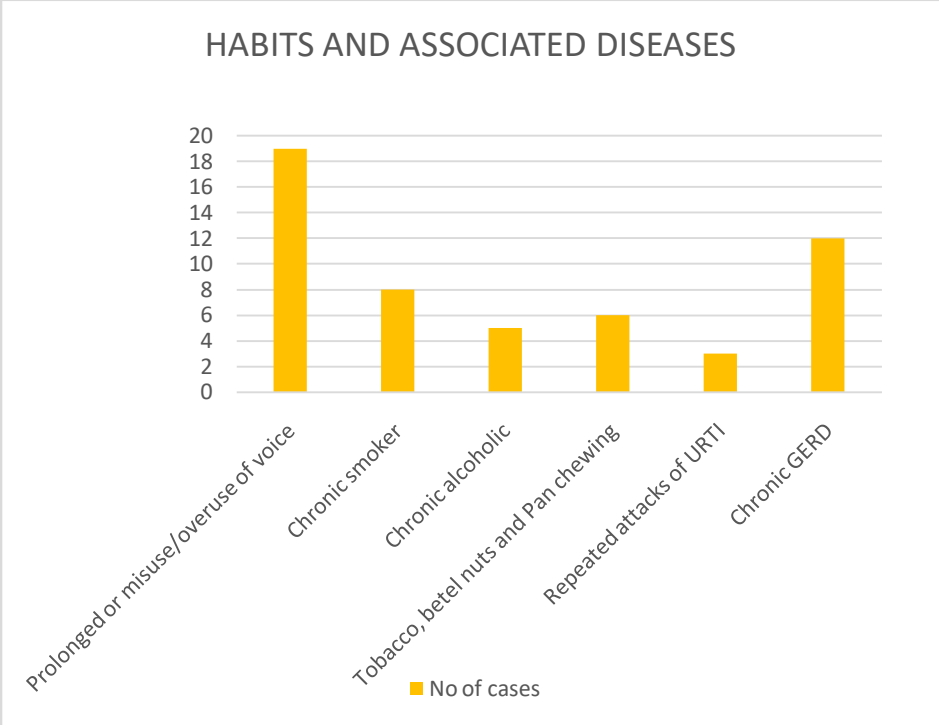


Table 4 and 5 shows vocal cord lesions occurs to people with prolonged voice abusers like teachers, housewife (30%) because of their screaming and shouting and a bad singer can lead to vocal lesions. Cessation of addiction can minimise the appearance of vocal cord lesion. Our study shows 26.6% and 20% patients were affected with benign vocal cord lesion were addicted smoking and tobacco chewing habits respectively.

❖ After diagnosis of BVCL and its surgical treatment with conventional MLScopy; patients were assessed with voice changes in the form of its speech parameters such as MPT, VHI and GRBAS Score in preoperatively and post-operatively every 7, 30 and 90 days duration shown in Tables 6, 7, 8.

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A. MPT assessment

Table 6: Pre & Post Operative MPT of BVCL after 1 week

MPT In Sec	No. Of Cases in Pre & Post Operative						
	Nodules	Polyps	Haemangioma	Cyst	Papilloma	Reinke's oedema	Total
	Pre-Post	Pre-Post	Pre-Post	Pre-Post	Pre-Post	Pre-Post	Pre-Post
0-5	0 - 0	0 - 0	0 - 0	0 - 0	1 - 0	0 - 0	1 - 0
6-10	3 - 0	3 - 0	0 - 0	0 - 0	0 - 1	1 - 0	7 - 1
11-15	8 - 1	3 - 1	1 - 0	1 - 0	0 - 0	2 - 0	15 - 2
16-20	2 - 6	0 - 1	1 - 0	1 - 1	0 - 0	2 - 1	6 - 9
21-25	1 - 3	0 - 3	0 - 1	0 - 0	0 - 0	0 - 1	1 - 8
More than 25	0 - 4	0 - 1	0 - 1	0 - 1	0 - 0	0 - 3	0 - 10
Total	14	6	2	2	1	5	30

There is good improvement seen in mean MPT i.e. from preoperative 10.5 sec to 20.5 sec postoperatively after 1 week of conventional microscopic laryngeal surgery. With corticosteroids and voice rest; marked improvement seen after 3 months along with speech therapy. 10 out of 30 patients (33.33%) shows MPT more than 25sec in 1 week postoperative.

B. VHI Score assessment

Table 7: Pre and Post-Operative VHI Scores after 4 week

VHI Score with severity	No. Of Cases of Benign Vocal Cord lesion Pre and post operative						Total
	Nodules	Polyp	Haemangioma	Cyst	Papilloma	Reinke's oedema	
	Pre-Post	Pre-Post	Pre-Post	Pre-Post	Pre-Post	Pre-Post	Pre-Post
0 –30 (mild)	8 - 11	1 - 5	1 - 2	1 - 2	0 - 0	0 - 4	11 - 23
31-60 (moderate)	6 - 3	5 - 1	1 - 0	1 - 0	0 - 1	5 - 1	18 - 6
61-120 (severe)	0 - 0	0 - 0	0 - 0	0 - 0	1 - 0	0 - 0	1 - 1
TOTAL	14	6	2	2	1	5	30

After 4 weeks of surgical and medical management VHI score in preoperative 18cases (60%) were between 31-60score which has improved postoperatively from moderate to mild i.e. upto 0-30 score seen in 23 (76.6%) cases and ultimately voice has improved.

C. GRBAS Score assessment

Table 8: GRBAS Score pre and post-operative after 3 months follow up

Sr. No.	GRBAS Score / No. of cases	Pre-operative	Post-operative
1	10	G3R2B0A1S2	G1R1B0A1S0
2	14	G2R2B0A3S2	G0R1B0A0S0
3	6	G1R1B0A0S2	G1R0B0A0S1

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GRBAS score has improved in most of the cases from grade-3 to grade-1 or grade-0 as seen above in table 8.

- After 3 months follow up, on clinical history and rigid Hopkin's endoscopy shows, only 1(3.33 %) case of recurrence of vocal cord polyp due to poor compliance to speech therapy and had not quit smoking who needed revision procedure.

A case of bilateral vocal cord papilloma required two stage surgery after at 4 weeks of medical management and1st surgery due to incomplete excision of lesion so as to avoid development of laryngeal web.

VII. Discussions

We have studied 30 patients with various benign vocal cord lesions operated with conventional ML-Scopy. Our analysis was as follows:

BVCL in our study, the commonest pathology was vocal cord nodules 14 (46.66%) cases were noted. Similarly noted in study of Brodnitz who reported 45% of vocal nodules.[27] (20%) 6 cases of vocal cord polyp similar with incidence of study of Mahesh Chandra et al and Kotby et al i.e. 24%.[28,29]

Most of our cases were in the 31-50 years of age, which included total 20 cases i.e. almost more than 50% also seen in Siddapur GK et al[30] and Guha et al[31] of benign vocal fold lesion. In our study female preponderance was seen in cases of vocal cord nodules where 53.3: 40% of female: male seen as inverse findings in the study by Chopra et al.[32] As per occupation, 9 (30%) cases were housewives, 8 (26.66%) were labourer, 3(10%) cases of each were teachers and businessmen. Even our study matches with Ruma Guha et al which showed most of the lesions are common in middle age house wife (28%) followed by office workers (26%) and Labourer (22%).[31]

All of our patients had change of voice/hoarseness as their major presenting complaint. Siddapur GK et al study shows hoarseness of voice, vocal fatigue and foreign body sensation as the commonest presenting symptoms.[30] It is often seen in patients who are chronically exposed to irritants such as tobacco smoke.[30]

The mean MPT preoperatively was 10.5seconds and after 1 week post-operatively was 20.5seconds. In 1week post-operative, 33.33% cases had their mean MPT more than 25seconds; which significantly improved to 50% after 3months with voice rest and speech therapy, study by Emilie Bequignon et al in 2013 had similar results.[33]

In a study by Kiagiadaki D et al the maximum phonation time significantly improved post microlaryngoscopy with voice rest. Also noticable improvement was seen in overall GRBAS score. And mean VHI score after 4 weeks shows 76.6% cases improvement into 0-30 VHI Score. While after 3 months post-operative correlated with study by Emilie Bequignon et al and Devora Kiagiadaki et al study [33,34]

Surgical approach through conventional ML-Scopy with post-operative speech therapy was the mainstay of our treatment.[35] Excision of vocal cord lesion with maximum preservation of normal mucosa is supported by Singhal et al (94%) and Hegde et al (83.29%)[36,32]

Outcome was assessed by various speech indices, symptomatology and Hopkins rigid 70^0 scopy. The patients were assessed at 7th day post-operative period and then at 1 and 3months post-operatively.

Nowadays with advent technology; laser assisted, powered instrument assisted like laryngeal microdebrider microscopic laryngeal surgery has become more precise than conventional surgery. Cons of these new technology are that they are costly and require good surgical skill.

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Ethical approval: Not required

VIII. Conclusions

In our study of 30 Cases of benign vocal cord lesions the following conclusions were made.

1. Common cases of benign vocal cord lesions presenting to us were of Vocal cord nodules (46.66%), Vocal cord polyps (20 %) and Reinke's edema (16.66 %).
2. The mean age of presentation of cases of benign vocal cord lesions was 40.5 years with female preponderance in our study especially in cases of vocal cord nodules. Overall most of the cases of benign vocal cord lesions were in the age group of 31 to 50 years.
3. Commonest cause of benign vocal cord lesions was phonotrauma most commonly due occupational demand, habits and reflux.
4. Satisfactory improvement were obtained post-operatively with respect to the symptoms, speech parameters (the mean MPT, mean VHI score, GRBAS Score) and rigid Hopkins 70^0 scopy examination.
5. Conventional microlaryngoscopic surgery are cheap, effective than advent technology where skillful hands required.

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Incidence and Outcome of Vocal Cord Polyp: An Endoscopic Experience and Perception

By Delwar AHM, Chowdhury NK, Rahman MS, Khan AM & Hossain ABMT

Abstract- *Background:* The larynx is an intricate part of the body which has to perform a very composite function like protection, respiration, phonation. To carry out the function, larynx should be adaptable and flexible. Any structural disorder like vocal cord polyp alter these specialized function and squander the laryngeal pacing, and increasing voice discomfort of the patient like hoarseness, dysphonia, and odynophagia day by day. Phonosurgery is the mainstay of treatment.

Methods: It is a cohort retrospective study of 54 cases in the Department of Otolaryngology and Head-Neck Surgery, Comilla Medical College, Bangladesh, from 20 February 2017 to 27 October 2019.

Result: Incidence of vocal cord polyp in laryngeal disorder patient was 6.83%, and the laryngeal operative patient was 28.27%. All patients were treated by micro laryngeal surgery with rigid Hopkin's laryngeal telescope, and setback was 2 (3.70%). Of them, male were 41(75.92%), females were 13(24.08%), below 20 years were 2(3.70%), 20-50years 39(72.23%,) and above 50years 13(24.07%), unilateral was 50(92.59%) and 4(7.41%) were bilateral, smoker was 41(75.92%), nonsmoker 13(24.08%), industrial workers were 21(38.89%), professional voice user was 13(24.07%).

Keywords: *vocal cord polyp, micro laryngeal surgery (MLS), gastroesophageal reflux disease (GERD), laryngopharyngeal reflux (LPR).*

GJMR-J Classification: *NLMC Code: WU 610*



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Delwar AHM [α], Chowdhury NK [σ], Rahman MS [ρ], Khan AM [ω] & Hossain ABMT [¥]

Abstract- Background: The larynx is an intricate part of the body which has to perform a very composite function like protection, respiration, phonation. To carry out the function, larynx should be adaptable and flexible. Any structural disorder like vocal cord polyp alter these specialized function and squander the laryngeal pacing, and increasing voice discomfort of the patient like hoarseness, dysphonia, and odynophagia day by day. Phonosurgery is the mainstay of treatment.

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Conclusion: Multidimensional assessment and multi-professional team approach towards the treatment of a patient may fulfill the patient vocal requirement.

Keywords: vocal cord polyp, micro laryngeal surgery (MLS), gastroesophageal reflux disease (GERD), laryngopharyngeal reflux (LPR).

I. Introduction

For speech, normal structure of the vocal cord is essential that consists of epithelium and lamina propria or vocal ligament in which superficial layer or Reinke's space is most important. It is a potential space containing scanty connective tissue only. Phonation is making sounds that may be expressed by motor activity involves a highly specialized orchestration of laryngeal and respiratory neuromuscular discipline.[1] Periaqueductal grey matter(PAG) in the midbrain is an imperative site for mammalian voice production.[2] Vocal cord polyp is a nodular lesion which is a benign enlargement from the free edge of vocal cord which size is greater than three mm.[3] Phonotrauma due to vocal cord abuse or misuse, screaming or shouting, irritation due to smoking or industrial fumes, allergy and repeated infection is a significant factor in approbation for it.[4] Vocal abuse is misapplying of voice that strains or injuries the vocal cord that comprises excessive talking, speaking too loudly or at an abnormally high or low pitch.[5] Acute infective laryngitis and laryngopharyngeal reflux also irritates the vocal cords as a consequence of the production of vocal cord polyp.[6] Almost all vocal cord polyp patients had a history of cigarette smoking, and also an industrial workers who inhaled fumes everyday causes injury to a vocal cord leading to hyaline degeneration in polyps.[7] The vocal cord polyp may be hemorrhagic or gelatinous in appearance. The upshot of hemorrhagic polyp is disruption of the vascular basement membrane, capillary proliferation, thrombosis, minute hemorrhage, and fibrin exudation.[8] The consequence of the formation of gelatinous polyp is unknown.[9] They strike men more than women, and conventionally the age is between 4 to 6 decade. Vocal cord polyps are benign and most constitutional abnormalities, which are 41% of all benign laryngeal disease.[10] It alters the quality, creating rough voice which has lowered in pitch, cuts out in a speech that they have lost the part of the latitude of voice causes straining to talk.[11] However, treatment options of vocal cord polyp both medical and surgical or combined due to multiple etiological factors. Any inflammatory condition and laryngopharyngeal (LPR) or gastroesophageal reflux disease is treated by appropriate and effective drugs.[12] Voice therapy, preventive therapy may make the symptoms comfortable, but the resolution of polyp is scarcely possible.[13] Different types of technical approachs are available in micro laryngeal surgery. Horace Green described first direct laryngoscopical removal of vocal cord polyp.[14] Oskar Kleinsasser described the adaptation of micro larygoscopy and endolaryngeal microsurgery for fine manipulation of the vocal cord.[15] Benninger used the Co_2 laser and concluded that with the expert hand, it was excellent for phono surgery.[16] Some Surgeons were using a power instrument microdebrider but, knowledge of the accurate depth of resection should be learned before useing it. Some study reports concluded that less post-operative pain in microdebrider surgery and faster return to normal voice.[17]

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Our aim of the study is to find out the relative incidence, frequency, and presentation of vocal cord polyp and to compare the empirical study of different types of surgical procedures.

II. Methods and Materials

It is a cohort retrospective study of 54 patients who were attended in the outdoor with laryngeal disorder especially hoarseness of voice from 02 February 2017 to 10 October 2019 in the Department of Otolaryngology and Head-Neck Surgery, Comilla Medical College Hospital, Bangladesh. Out of three years outpatients, 791 patients were suffering from the laryngeal disorder. We performed the endoscopic assessment of all patients by rigid Hopkin's laryngeal telescope. Before examination, we used the 10-15% lidocaine spary in the oral cavity and oropharynx of the patient to prevent gag reflex, which mostly interfere with the examination and proper view of the larynx. The patient and the attendant, if the patient was the children gave the informed written consent about the examination procedure. Of 791 patients, 54 diagnosed as a vocal cord polyp. During that time, 191 routine laryngeal operative procedures were performed in which vocal cord polyp were 54 and post-operative recurrence was 2. We used GRBAS and RSI scale to determine the grading of severity and reflux- related to vocal cord polyp. The following data collected about the patient: Age, Sex, Personal habit, Occupation, operations, post-operative follow up, and complications. All data calculated by using the statistical software of SAS.

III. Results

The incidence of vocal cord polyp in total laryngeal disorder patients (791) was 6.83%, and total laryngeal surgery (191) was 28.27%. In our hospital set up we were following rigid laryngoscope set up with rigid Hopkin's laryngeal telescope 0^0 to perform MLS of vocal cord polyp. Recurrence after operation was 2(3.70%) (Figure-1). We were follow-up the patient 15 days interval for one month and monthly for three months. The recurrent two patients were a smoker. After 15 days of operation, they started smoking again. Junior trainee surgeons performed some operations. So both patient awareness factor and competent surgeon factor were responsible for the recurrence. Amidst 54, male was 41(75.92%) females were 13(24.08% (Figure-1). Regarding side, unilateral was 50(92.59%) in which left side 29(58%), and right side 21(42%), and bilateral were 04(7.41%) (Figure-1). Age allocated 10-20 years were 2(3.70%), 20-30 years were 12(22.23%), 30-40 years were 14(25.93%) , 40-50 years were13(24.07%) and above 50 years were 13(24.07%) whereas the maximum incidence in between 3nd to 5th decade was 39(72.23%) in which lowest age was 13 and highest one was 89 years whereas mean age was 47.26 years (Figure-2). Personal history revealed smoker was 41(75.92%) , non-smoker was 13(24.08%), industrial workers were 21(38.89%), and professional voice user was 13(24.08%) like Hawker, Teacher, leader and the 13 years old boys was a student of Madrasa where he was bound to read Holy Quran with a very robustious voice (Figure-3). The presenting symptoms divided into three categories depending on the auditory-perceptual evaluation method of hoarseness is the GRBAS scale, which gives scores of 0, 1, 2 or 3 for the Grade of hoarseness: Roughness, Breathiness, Asthenia, and Strain, where 00 is normal, 01 is a slight degree, 02 is a medium degree, and 03 is a high degree.[18,19] In our study, slight degree was 34(62.96%), the medium was 13(24.08%), and the high was 07(12.96%)(Figure-4). RSI scale indicated the GERD or LPR related vocal cord polyp was 21(38.89%)[20](Figure-4).

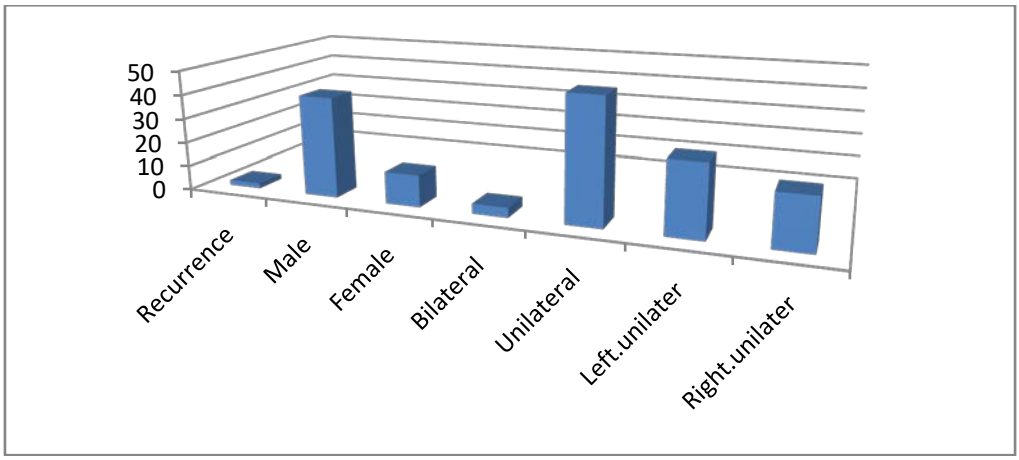


Figure-1: Recurrence after surgery, Gender epidemiology and Side distribution.[n-54;Recurrence-2(3.70%):{Gender epidemiology; Male-41(75.92%):Female-13(24.08%)}:{Side distribution;Bilateral-4(7.41%):Unilateral-50(92.59%):Left-29(58%):Right-21(42%)]

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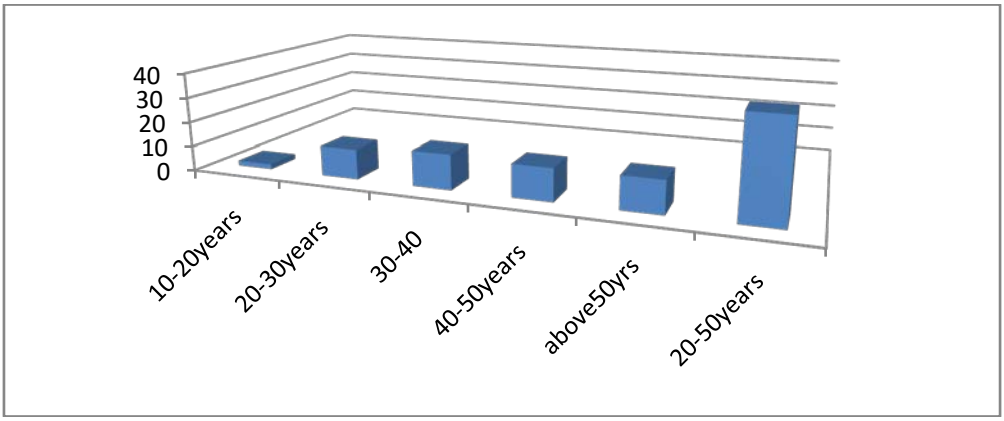


Figure-2: Age Allocation {n-54;10-20yrs-2[3.70%]:20-30yrs-12[22.23%]:30-40yrs-14[25.93%]:40-50yrs-13[24.07%]: Above 50 yrs-13[24.07%]: 20-50 years-39[72.23%)}

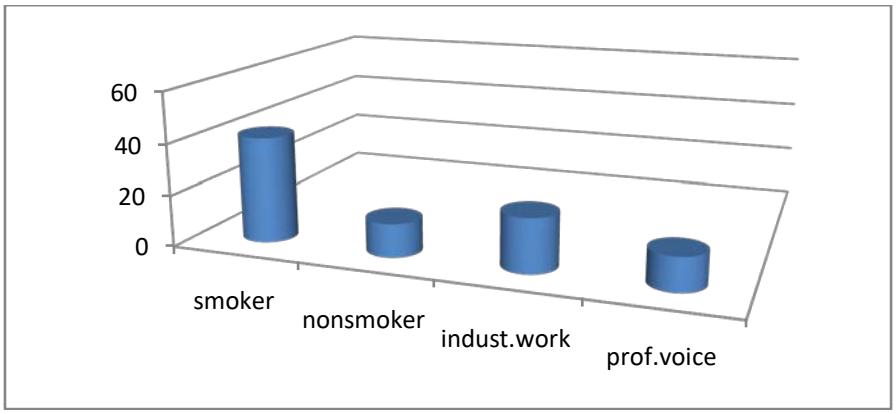


Figure-3: Personal History.[n-54;Smoker-41(75.92):Nonsmoker 13(24.08%):Industrial worker-21(38.89%):Professional voice user-13(28.08%)]

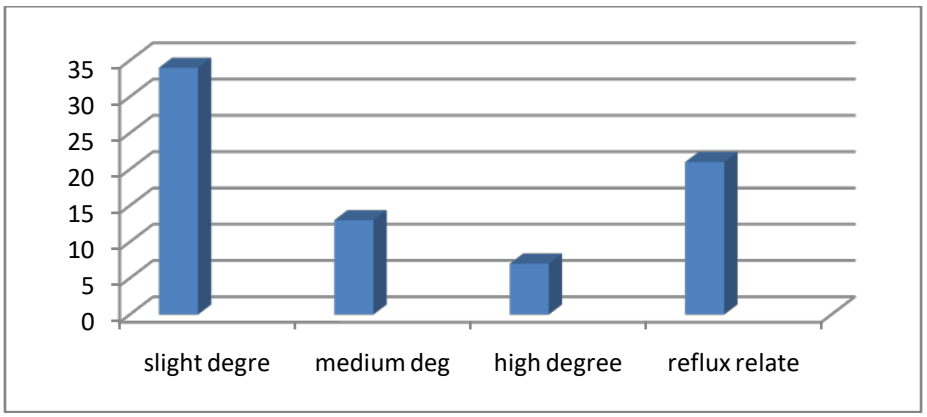


Figure-4: Presenting features: [n-54;Slight degree-34(62.96%):Medium-13(24.08%):High-7(12.96%):Reflux related-21(38.89%)]

IV. Discussion

The incidence of vocal cord polyp in our study was 6.83% and 28.27% in a different study groups. Due to the discrete study group there was a divergent result in which Vasconcelos D. et al. showed incidence in smoker and GERD group was 1.0-1.7%.[21] Goswami S. et al. series displayed 16.86% vocal cord polyp in total laryngeal disorder patient.[22] But Woo et al. series revealed that vocal cord polyp were the second most prevalent laryngeal lesion.[23] In our endoscopic assessment and evaluation of study, vocal cord polyp was the fourth type of the laryngeal disorder.

In gender epidemiology, male were predominant in our study, supported by a large number of studies.[24] But fewer research work arrayed female preponderance may be due to a large number of

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women of those countries were working in voice profession.[25]

About personal habits, 75.92% were smokers that also held up by other studies.[26] Every-where in the road, market, public places even in hospitals people smoke without any hesitation.

Regarding age, in our study displayed maximum age incidence was 3rd to 5th decade in which was followed out by the Karagama YG. et al. series where he stood up for 4th to 6thdecade.[27] Some other studies showed that the maximum age incidence in the 5th decade.[28]

About laterlity, Goswami S. et al. series showed only unilateral polyp; bilateral polyp was absent in their study.[22] In our work, it was 7.4% which kept up by Kleinasser O. series that was 5%.[15]

In presenting features we followed the auditory-perceptual evaluation method for hoarseness in which the slight degree was 62.96%, the medium degree was 24.08%, and the high degree was 12.96%) near other studies of Hirano M. study and Okano W. et al. series.[18, 19] Another group of the patient presented with GERD and LPR related symptoms was 38.89% which supported by Mosca F. et al. series used RSI.[29]

About treatment of vocal cord polyp, some study displayed medical or non-invasive treatment, which included voice rest, menthol steam inhalation, anti-allergic, anti-reflux, and antiulcer drug with speech and language therapy for voice disorders and preventive measure relieved the symptom.[30] In our study, we were treated the patient by both surgical and medical modalities. In our surgical set up, we practiced MLS by rigid Hopkin's laryngeal telescope.[31] Recurrence was 2 cases in our study, which was against Goswami S. et al report, in their series recurrence was 18 in 129.[22] After surgical treatment, we advised them verbally and write in discharge paper to avoid vocal misuse, overuse and abuse, and refrain from smoking forever, which was an important factor in relapse.[32]

We were follow-up the patient for four months after surgery, fifteen days interval for monthly and monthly for three months. The recurrence cases did not stop their smoking and continued the voice abuse, and these two cases polypectomy did the junior trainee surgeon, which may be the factor of incomplete clearance of the disease. Another 52 cases properly maintained the advice and their voice was fine up to the last follow-up.[33]

V. Conclusion

Vocal cord polyp is one of the common laryngeal disorders which occur in middle-aged people and intervene with the quality of life. Rapid industrialization without proper management of its fume and uncontrolled smoking is the common cause of vocal cord polyp like developing, and also the developed countries. Fast and spicy food increases the number of GERD and LPR patient, another factor to raise the vocal cord polyp need multi-professional treatment approach. Prevention and change of personal habit decrease the incidence of vocal cord polyp. Surgery and voice rest are the principal treatment modalities of vocal cord polyp. Surgery aims is to restore normal voice by making the edge of vocal cord smooth and disease-free. Expert surgeons and responsible patients reduce the recurrence rate.

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

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Morphometric Analysis to Identify the Perilesional Tissue in Oral Epithelial Dysplasia: A Novel Objective Tool

By Meenakshi Singhal , Devi Charan Shetty , Ankita Tandon & Saurabh Juneja

Abstract- Histopathological changes and molecular events that are hidden in otherwise clinically normal-appearing mucosa may facilitate the detection of early changes in the surrounding mucosa, which can be assessed in perilesional tissue through morphometric analysis.

Aim: To determine the perilesional tissue in oral mucosal biopsies through morphometric analysis.

Material & Methods: 50 formalin-fixed, paraffin-embedded tissue specimens were taken, which include 40 cases of oral epithelial dysplasia with perilesional tissue marked by India ink and 10 cases of the normal buccal mucosa. Histopathological examination was done to evaluate the presence or absence of dysplastic features in lesional and perilesional tissues. Morphometric analysis was done using epithelial thickness & length between the apical membrane of basal cells & the basement membrane.

Results: There was no significant differences in the epithelial thickness between lesional & perilesional tissue. However, the length between the apical membrane of basal cells & the basement membrane was found to be significantly higher on the perilesional side in comparison to lesional side.

Keywords: morphometry, epithelial dysplasia, perilesional tissue, oral potentially malignant disorders (OPMDs).

GJMR-J Classification: NLMC Code: WU 500

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Morphometric Analysis to Identify the Perilesional Tissue in Oral Epithelial Dysplasia: A Novel Objective Tool

Meenakshi Singhal [α], Devi Charan Shetty [σ], Ankita Tandon [ρ] & Saurabh Juneja [ω]

Abstract- Histopathological changes and molecular events that are hidden in otherwise clinically normal-appearing mucosa may facilitate the detection of early changes in the surrounding mucosa, which can be assessed in perilesional tissue through morphometric analysis.

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Results: There was no significant differences in the epithelial thickness between lesional & perilesional tissue. However, the length between the apical membrane of basal cells & the basement membrane was found to be significantly higher on the perilesional side in comparison to lesional side.

Conclusion: Numerous histological features which differentiate neoplastic tissue from healthy tissues remain subjective. Morphometric analysis can be considered as an effective guide in evaluating the progression of the normal epithelium to dysplastic epithelium in otherwise clinically normal mucosa. Objective analysis based on quantitative guidelines would be extra convenient and can be considered handy than a subjective framework.

Keywords: morphometry, epithelial dysplasia, perilesional tissue, oral potentially malignant disorders (OPMDs).

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I. Introduction

- Oral carcinogenesis presents a multistep model of development, as it is unlikely that there is uniformity in the way individual patients or tissues behave.[1] Although Oral squamous cell carcinoma (OSCC) is not linear in its development, it begins as simple epithelial hyperplasia progresses through epithelial dysplasia (OED), signifying more extensive genetic aberrations.[2] Such predecessor lesions are often referred to as 'Oral potentially malignant disorders (OPMDs)' since not all lesions and conditions described under this term transform to cancer.[3] The transition from normal oral epithelium to oral dysplasia and cancer results from accumulated genetic alterations.[4] Underlying the histological transition of the normal oral epithelium through a precancerous state to invasive carcinoma are multiple molecular and cellular changes.[5]
- Clinically OPMDs may present as leukoplakia, erythroplakia, oral lichen planus, and Oral Submucous Fibrosis. A variety of alterations accumulate to potentiate this transition to malignancy. Oral leukoplakia, harboring histologic features of hyperplasia and/or dysplasia is frequently encountered in the oral cavity.[6] The rate of malignant transformation in OPMDs varies from 0% to 20% in 1 to 30 years. The malignant transformation risk of leukoplakia is associated with the lesional histology. The ability to identify oral leukoplakia patients at increased risk of cancer development is critical for improving control of oral cancer.[7]
- Therefore, this study was designed to establish an objective tool to assess the perilesional tissue for histopathological changes in an otherwise clinically normal-appearing mucosa to reduce subjective bias and to objectively assess the predictive value of morphometric analysis in predicting dysplasia in otherwise normal mucosa through morphometric analysis.

II. Materials and Method

- 50 formalin-fixed, paraffin-embedded tissue specimen were taken, which include 40 cases of

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oral epithelial dysplasia with perilesional tissue and 10 cases of the normal buccal mucosa. 4 micron thick sections were taken & stained with H & E. The sections were microscopically photographed using Olympus camera.

- Histopathological examination was done to evaluate the presence or absence of dysplastic features in lesional and perilesional sides of 40 cases of Oral epithelial dysplasia. The marginal areas of the tissue were excluded from the analysis because they often show hyperchromatism artifacts. All cytological and architectural alterations established by WHO in the year 2017 for OED were evaluated.[8]

Following histopathological factors were evaluated in each case- in lesional and perilesional tissue

Dysplastic features
Architectural characteristic
Irregular epithelial stratification
Loss of polarity of basal cells
Drop-shaped rete ridge
Increased number of mitotic figures
Abnormally superficial mitotic figures
Premature keratinization in single cell
Keratin pearls within rete pegs
Cellular characteristics
Abnormal variation in nuclear size
Abnormal variation in nuclear shape
Abnormal variation in cell size
Abnormal variation in cell shape
Increased N:C ratio
Atypical mitotic figures
Increased number and size of nucleoli
Hyperchromasia
Loss of epithelial cell cohesion

Morphometric analysis was done using the image analysing software Magnus Pro.

Two histopathopathological factors were quantified morphometrically in each case[9] –

i. Epithelial thickness &
ii. The length between the apical membrane of basal cells & the basement membrane. (Basal Cell Diameter)

III. Results

Table 1: Comparison of Cytological and Architectural Alterations between Lesional and Perilesional tissues of study cases

Dysplastic features	Lesional (n=40)	Perilesional (n=40)	P value
Architectural characteristic			
Irregular epithelial stratification	2	0	0.499
Loss of polarity of basal cells	10	3	0.01
Drop-shaped rete ridge	12	2	0.129
Increased number of mitotic figures	4	1	1
Abnormally superficial mitotic figures	1	0	0.317
Premature keratinization in single cell	2	0	0.499
Keratin pearls within rete pegs	0	0	0
Cellular characteristics			
Abnormal variation in nuclear size	8	2	0.317
Abnormal variation in nuclear shape	8	1	0.678
Abnormal variation in cell size	6	1	0.079
Abnormal variation in cell shape	6	1	0.079
Increased N:C ratio	16	6	0.031
Atypical mitotic figures	2	0	0.499
Increased number and size of nucleoli	21	6	0.01
Hyperchromasia	34	11	0.034
Loss of epithelial cell cohesion	3	0	0.457

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The table shows cytological and architectural alterations between Lesional and Perilesional tissues of study cases. The results show that out of 40 cases of lesional and perilesional tissues of epithelial dysplasia- Loss of polarity of basal cells, Increased N:C ratio, Increased number, and size of nucleoli and Hyperchromasia showed marked difference which was found to be statistically significant ($p \leq 0.05$).

Table 2: Morphometric analysis of epithelial thickness and basal cell diameter in Lesional and Perilesional tissues of study cases

I.	Groups	N	Mean± Std Deviation (μ)	p value
Epithelial Thickness	Control	10	1310.97±58.908	.289
	Lesional	40	1734.22±520.979	
	Perilesional	40	1836.99±634.631	
Basal Cell Diameter	Control	10	50.55±3.544	.013
	Lesional	40	48.82±3.777	
	Perilesional	40	52.03±4.875	

The above table shows the morphometric analysis of epithelial thickness and basal cell diameter in lesional and perilesional tissue of study cases. The results show that out of the total 50 cases, 40 each were of lesional and perilesional tissues of epithelial dysplasia with 10 cases of the normal buccal mucosa. The epithelial thickness was 1310.97 ± 58.90 in the control group, 1734.22 ± 520.97 in the lesional group and 1836.99 ± 634.63 in the perilesional group, which was statistically not significant ($p \geq 0.05$). The basal cell diameter in the control group was 50.55 ± 3.54, in the lesional group 48.82 ±3.77 and in the perilesional group 52.03 ± 4.87, which was statistically significant ($p \leq 0.05$).

IV. Discussion

The transition from normal oral epithelium to oral dysplasia and cancer results from accumulated genetic alterations.[4] Underlying the histological transition of the normal oral epithelium through a precancerous state to invasive carcinoma are multiple molecular and cellular changes. Clinically OPMDs may present as leukoplakia, erythroplakia, oral lichen planus, and Oral Submucous Fibrosis. A variety of alterations accumulate to potentiate this transition to malignancy. Oral leukoplakia, harboring histologic features of hyperplasia and/or dysplasia, is frequently encountered in the oral cavity.[6] The rate of malignant transformation in OPMDs varies from 0% to 20% in 1 to 30 years. The malignant transformation risk- of leukoplakia is associated with the lesional histology.[7] The early identification of oral leukoplakia patient is critical for improving the control of oral cancer.

Numerous histological features which differentiates neoplastic tissue from the healthy tissues have been exhaustively discussed, but the findings remain subjective among observers. The WHO classification remains the gold standard for diagnosing OED, however, subjective bias was found, As the WHO classification includes vague histopathological factors, still there is a lack of evidence on how individual features should be weighted.

Objective analysis based on quantitative guidelines would be extra convenient and can be considered handy than a subjective framework.[10]

In the present- study, Histopathological examination was done to evaluate the presence or absence of dysplastic features in lesional and perilesional sides of 40 cases of Oral epithelial dysplasia. The marginal areas of the tissue were excluded from the analysis because they often show hyperchromatism artifacts. All cytological and architectural alterations established by WHO in the year 2017 for OED were evaluated. The results show that out of 40 cases of the lesional and the perilesional tissues of epithelial dysplasia- Loss of polarity of basal cells, Increased N:C ratio, Increased number, and size of nucleoli and Hyperchromasia showed marked difference which was statistically significant ($p \leq 0.05$) *(Table 1)*

In the present study, the morphometric analysis of epithelial thickness and basal cell diameter in the lesional and the perilesional regions of study cases was performed. The results show that the epithelial thickness was 1310.97 ± 58.90 in the control group, 1734.22 ± 520.97 in the lesional group and 1836.99 ± 634.63 in the perilesional group, which was statistically non

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significant ($p \geq 0.05$). *(Figure 1)* The basal cell diameter in the control group was 50.55 ± 3.54, in the lesional group 48.82 ±3.77 and in the perilesional group 52.03 ± 4.87, which was statistically significant ($p \leq 0.05$). *(Figure 2)* The resuls of our study also reveal that there is an increase in epithelial thickness and basal cell diameter of perilesional tissue in comparison with lesional tissue. *(Table 2)* These findings are in accordance with the study done by *Okamura et al. (2016)*[9] where he demonstrated that epithelial thickness and basal cell diameter is a reliable indicator in determining and distinguishing the lesional and perilesional tissues. They further elucidated that the disordered arrangement of the basal cells is more useful than other candidate factors for determining the extent of lesional tissues. Further *Nag et al. (2018)*[11] discussed that morphometry could be administered discriminatorily on specimens having lesional and perilesional tissue, which is problematic to assess precisely through histopathology and postulated that Gutka and Pan Masala can lead to the emergence of high levels of reactive oxygen species (ROS) near the lesion leading to the damage of the surrounding normal tissue. Carcinogens decrease the capacity of the cytoplasm to mature and boost the nuclear parameters and cause a reduction in cellular parameters. Hence, they concluded that between normal and premalignant cells, cellular mean and cellular diameter was established to be lowest in premalignant cells.[9,11]

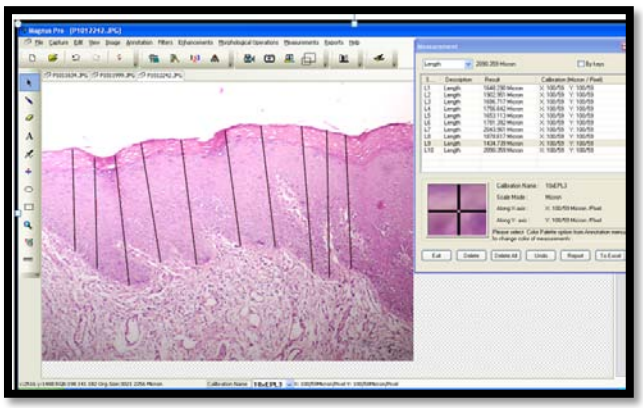


Fig. 1: Morphometric analysis of epithelial thickness (Magnus Pro Image analysis software, Olympus Inc.)

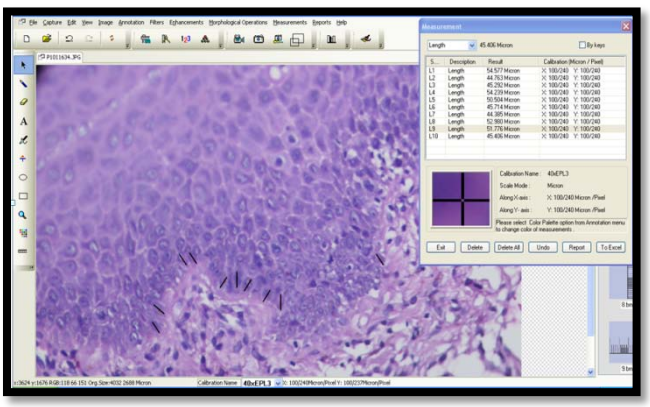


Fig. 2: Morphometric analysis of Basal cell diameter (Magnus Pro Image analysis software, Olympus Inc.)

V. Conclusion

An early and definitive diagnosis of epithelial dysplasia followed by complete excision of the lesion with safe margins is important to prevent the progression of Oral Epithelial Dysplasia into malignancy. Morphometric analysis can be considered as an effective guide to evaluate the progression of the normal epithelium to dysplastic epithelium in otherwise clinically normal mucosa. The results of the present study indicate morphometric analysis as an emerging objective tool to assist the routine histo-pathological diagnosis.

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3D Evaluation of Soft Tissue Changes Following Class III Orthognathic Surgery- A Systematic Review

By Dr. Janani Jayapal, Dr. Abinaya Somaskandhan, Dr. Ratna Parameswaran & Dr. Devaki Vijayalakshmi

Abstract- *Background:* The principle goal of orthognathic surgery is to establish a balanced and stable dento-skeleto facial complex.This mandates the surgeon and the orthodontist to be able to predict the soft tissue changes to the orthognathic surgery precisely, which is accurately possible using 3-D imaging.

Aims: To evaluate the soft tissue changes following class III orthognathic surgery using 3-D imaging. *Settings and Design:*Systematic review.

Methods and Material: This review was conducted according to Preferred Reporting Items for Systematic Reviews and meta-Analyses guidelines systematically searching the six databases including PubMed, Cochrane, Google Scholar, LILACS, Directory of Open Access Journals, and OpenGrey.

Statistical analysis used: Not applicable.

Results: This systematic review comprises of most UpToDate evidence from eleven articles answering the review questions.

Conclusion: Le Fort I advancement shows significant increase in the alar width, alar cinch, upper lip, chelion, labiale superius, crista philtri,pronasale and subnasale. Mandibular setback shows significant backward movement of soft tissue point B, labialeinferius and subnasale and chin.

Keywords: *3-dimensional, class iii skeletal base, soft tissue, orthognathic, systematic review.*

GJMR-J Classification: *NLMC Code: WU 400*



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Keywords: 3-dimensional, class iii skeletal base, soft tissue, orthognathic, systematic review.

I. Introduction

The main intent of any orthognathic surgery is to normalize the skeletal discrepancies and facial disharmony. Orthognathic surgery, with the movement of skeletal tissues restores occlusal function and induces soft tissue changes which establishes the facial harmony which is the ultimate goal. It is of utmost importance to properly analyse and correctly diagnose the case for best treatment planning to achieve better prognosis. [1, 2] The results so obtained are known to be more stable and reliable.

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Surgery for mandibular prognathism began early in the 20th century with treatment that consisted of a body ostectomy, removing a molar or premolar tooth and an accompanying block of bone. Edward Angle, described how the treatment outcomes would have been better if orthodontic appliances and occlusal splints were used. The introduction of sagittal split ramus osteotomy in 1957 marked the beginning of modern era in orthognathic surgery. Le-Fort I down fracture technique that allowed maxilla to be repositioned in all the three planes of space was a modification of the American surgeons for maxillary surgery that had earlier been developed in Europe in 1960s. By 1980s, it was possible to reposition either or both jaws in all the planes of space and acquire stable results.

Being able to predict soft tissue changes that will be encountered following surgery has been precisely possible with the advent of 3-D imaging. Movements of the jaws during surgery leads to changes in all the 3 dimensions which makes it important to analyse and interpret the treatment outcome using 3-D imaging. 3-D imaging is the best way available which gives accurate measurements in anteroposterior, supero-inferior and mesiodistal planes. Analysing the hard and soft tissues of the face in three dimensions is needed to achieve good post-operative results. [3,4] Two-dimensional analysis by radiographs and cephalometry have its own limitations as it gives the data in only 2 axis. Until now, many techniques for 3-dimensional (3D) soft-tissue analysis have been developed, including methods of moire stripes, stereophotogrammetry, 3D computed tomography, and 3D laser scanning. [5-7]

The primary objective of this systemic review is to systematically investigate and evaluate 3 dimensionally the soft-tissue changes in Class III orthognathic patients which includes Le Fort I maxillary advancement, Bilateral sagittal split osteotomy with mandibular setback and a combination of these. The study was divided into 2 parts: (1) evaluating the relationship between soft tissue and skeletal movements in class III orthognathic surgeries, and (2) to determine which of the soft tissue region undergo most changes.

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II. Materials and Methods

a) Protocol and Registration

This review was based on a specific protocol developed and piloted following the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) P statement.[8-10]

b) Eligibility Criteria

Eligibility criteria was based on the research question defined in the PICO format. Do patients who have undergone mandibular setback or maxillary advancement or a combination of both (P) and evaluated using 3D imaging techniques (I) exhibit before and after (C) changes in the facial soft tissues(O).

The inclusion criteria primarily composed of human clinical trials, patients of either sex who were over the age of 18 years, who had undergone single jaw and bi-jaw orthognathic surgeries for class III correction, had 3-D records, Data published in 2009-2019 which have been published in English.

The exclusion criteria included animal or in vitro studies, narrative or literature reviews, and case reports and series, patients who have cleft lip and palate, craniofacial disorders, degenerative conditions, trauma, temporomandibular joint pain, previous orthognathic surgery, inflammatory conditions, degenerative conditions, facial asymmetries.

c) Search Strategy for Identification of Studies

A detailed search was carried out in two parts. Firstly, an electronic search was carried out based on a search strategy developed on PICO format and was checked using the PRESS checklist for systemic reviews. The search terms include controlled vocabulary, author keywords, Boolean operators, and truncations which were appropriately used and revised for each database, considering the differences in controlled vocabulary and syntax rules. The following electronic databases were searched: PubMed, Google Scholar, LILIACS, Cochrane registry of clinical trials, and Directory of Open Access Journals, and unpublished literature was searched on opengrey.eu.

The second part of the search was hand search of the relevant orthodontic journals. The following journals were searched:

- American Journal of Orthodontics and Orthopedics
- British Journal of Orthodontics (Journal of Orthodontics)
- European Journal of Orthodontics
- Journal of Indian Orthodontic Society
- Korean Journal of Orthodontics
- The Angle Orthodontist
- World Journal of Orthodontics
- Journal of Cranio-Maxillo-Facial Surgery
- American association of oral and maxillofacial surgeons
- International Journal Oral and Maxillofacial Surgery

The hand search included screening of contents, title, and abstracts done to identify all relevant studies in the above-mentioned journals from January 2009 to December 2019. The reference lists of all eligible studies were hand searched for additional studies (Figure 1). Study selection after the duplicate references were removed using references software (MENDELEY 1.19.2, Elsevier, 2018, New York, USA).

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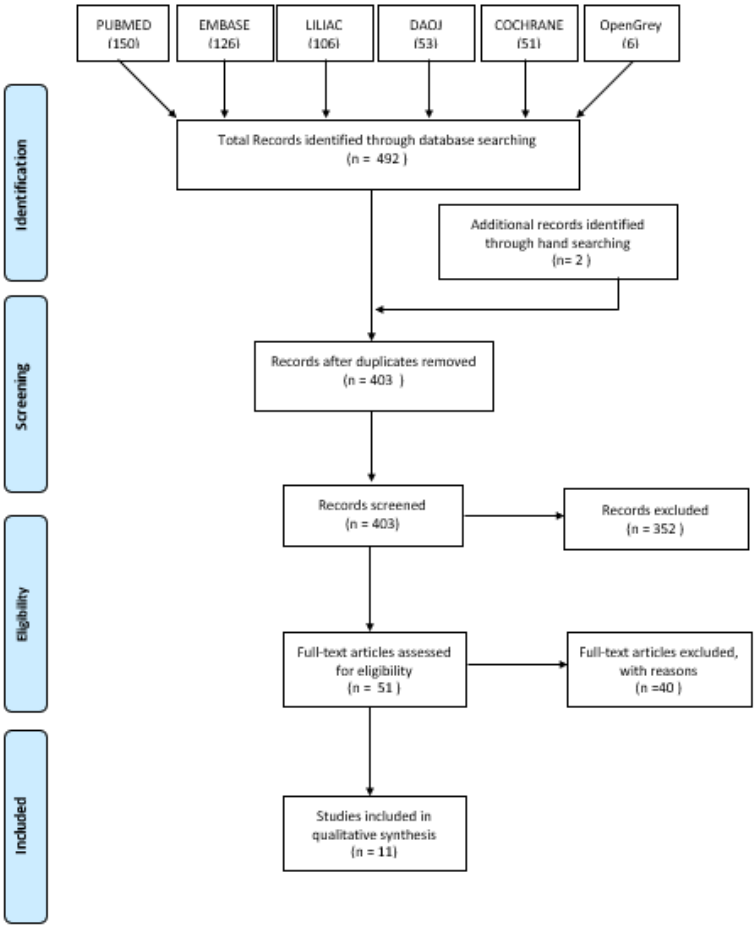


Figure 1: Prisma Flow Chart

d) Assessment of Risk of Bias

Two review authors (J.J and A.S) independently assessed the risk of bias of the eligible trials according to the Cochrane Collaboration's risk of bias tool. In cases of discrepancy, consensus was obtained by consulting a third reviewer (R.P). The domains assessed were (1) random sequence generation; (2) allocation concealment; (3) blinding of participants; (4) blinding of personnel; (5) blinding of outcome assessment; (6) incomplete outcome data; (7) selective reporting; (8) other biases (baseline imbalance, similarity in using cointerventions between groups, and inadequate statistical analysis). The potential risk of bias for each study was classified as high, unclear, or low. (Figure 2)

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Figure 2: Risk of Bias

e) Data Extraction

The studies were assessed for inclusion independently by two authors (J.J. and A.S.) who were not blinded to the identity of the authors of the studies, their institutions, or the results of their research. Study selection procedures comprised reading of titles, abstracts, and full texts. After they excluded non-eligible studies, the full report of publications considered eligible for inclusion by either author was obtained and assessed independently. In case of disagreements between the authors (J.J. and A.S.), consultations with another author (R.P) was held. A record of all decisions on study identification was kept.

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III. Results

The results of this systematic review are detailed and tabulated in Table 1 with eleven included articles which answer the review questions.

S. No	Author	Journal name/ Year	Aim	Sample	Intervention	Results
1	Hyoung-SeonBaik et al.[1]	American Journal of orthodontics and Dentofacial Orthopedics (2010)	The purpose of this study was to use a 3-dimensional laser scanner to evaluate the soft-tissue changes after the correction of skeletal Class III malocclusions with orthognathic surgery.	20 Korean patients with skeletal Class III malocclusion who underwent LeFort I osteotomy with maxillary advancement and posterior nasal spine impaction, along with bilateral intraoral vertical ramus osteotomy for mandibular setback. -10 patients (group1) had 2-jaw surgery with genioplasty, and the other 10 (group 2) had 2-jaw surgery without genioplasty.	Three-dimensional images of thepatients were acquired with a 3D laser scanner.	-There was no significant difference between the groups in the horizontal ratios of the soft-tissue to hard-tissue changes. -There was no significant difference between the groups in the horizontal ratios of the soft-tissue to hard-tissue changes. -In both groups, the ratios of the horizontal changes in the paranasal area were higher than in the subnasale area. There were more changes in the subalar area than in the supracommissural area, and more changes in the chin and labiomental areas than in the subcommissural area. -Ala moved anterolaterally, and cheilion moved posteroinferiorly. The distance between upper-lip point and cheilion increased significantly. -In the 3D angles, transverse nasal prominence and transverse upper lip prominence increased significantly.
2.	Yong-Kyu Lim et al.[6]	Angle Orthodontist (2010)	To evaluate whether mandibular setback surgery for Class III patients would produce gradients of three-dimensional soft tissue changes in the vertical and transverse aspects.	26 Class III patients treated with mandibular setback surgery using bilateral sagittal split ramus osteotomy.	Lateral cephalograms and 3D facial scan images were taken before and 6 months after the surgery, and changes in landmarks and variables were measured.	-Landmarks of the nose, mouth, and lips did not show any significant changes in position in the transverse direction. However, in the vertical direction and anteroposterior direction, there were significant changes in the positions of the landmarks with different patterns.
3.	Kyung-Min Oh et al.[12]	Journal of Cranio-Maxillo-Facial Surgery (2012)	To evaluate Post-operative soft tissue changes in patients with mandibular prognathism after bimaxillary surgery.	25 patients before bimaxillary surgery (T0), at 2 months after surgery (T1) and at 6 months after surgery (T2).	Cephalometric variables from the reoriented volumetric images were measured and compared at T0, T1, and T2.	-The soft tissue in middle third of face moved forward at T1 and significantly moved backward from T1 toT2. -Most of the soft tissue changes from T1 toT2 were not correlated with the hard tissue changes, while the cheeks were positively correlated with the soft tissue around them.
4.	Bo-Ram Kim et al.[11]	International Journal of Oral Maxillofacial surgeons (2013)	The purpose of the study is to quantify the soft tissue changes after orthognathic surgery in 1 and 2 jaw surgery, in mandibular prognathism patients.	25 patients were assessed, who had undergone bimaxillary surgeries and those who had only undergone mandibular setback surgery.	Superimposition of pre and post volumetric images. (CBCT)	-Soft tissue changes were more evident in the midfacial area in 2-jaw group. -Soft tissue in lower third changed in both groups but not significantly.
5.	Verdenik et al.[13]	International Journal of Oral Maxillofacial Surgeons (2014)	To verify post operative changes within those regions not directly affected by surgical movements of underlying jaw bones.	83 young adults with skeletal class III deformities divided into 3 groups- BSSO setback, Le Fort I advancement of maxilla and a combination of both.	Pre and post optical scans were used and their difference were measured.	-Difference between left and right sides were very minimal. -Lefort I group encountered significantly greater changes in the cheek, nose and upper lip regions as compared to the combination group. -In contrast, chin and lower lip region was shown to encounter changes both in BSSO and combination and also in the Le Fort group, but was significantly smaller. -In the submandibular region, soft tissue changes was greater in the combination group, followed by BSSO and Le Fe Fort I respectively.

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6.	Raghu Devanna et al.[14]	Journal of Dentistry and Oral Biology (2017)	To compare and evaluatehard and soft tissue midface dimensions of Class I and Class III individuals using CBCT	30 Class I and 30 Class III CBCT images between the age group of 14-20 years were included in the study.	The CBCT images were analyzed with creation of hard and soft tissue slices.	The Class I male horizontal slices had smaller measurements ($P<0.05$) in both the soft and hard tissue than Class III by 0.4 mm to 1.5 mm at nearly nine measurements of PPA. The Class III sample pattern profile measurements were larger by 0.6 mm to 1.7 mm. The laterality measurements also found to be larger for the Class III as compared to Class I.
7.	Junho Jung et al.[2]	Head & Face Medicine (2018)	To evaluate the nasolabial soft tissue change three-dimensionally after orthognathic surgery, using a structured light scanner.	Thirty-two malocclusion patients, who underwent orthognathic surgery, were evaluated	CBCT and 3D facial scans were obtained before surgery and 3 months after surgery.	-In the Le Fort I advancement patients, the nasal tip moved 17% forward, compared to the maxillary bony movement, but the nasal prominence decreased 15%. -The alar width increased 4 mm after the advancement. -The relative ratio of the soft tissue movement to the bony movement after bilateral sagittal split osteotomy was about 21% at the Li point in the anteroposterior direction.
8.	Lun-Jou Lo et al.[7]	PLOS ONE (2018)	To investigate the relationship between soft and hard tissue movements in different facial regions through CBCT.	24 patients with class III malocclusion, and the status of undergoing two-jaw orthognathic surgery	Preoperative and postoperative CBCT images were superimposed using the surface registration method	-Changes in the upper lip, upper vermillion, chin region in the bijaw group was found to be significant.
9.	Rahul Tiwari et al.[15]	The Open Dentistry Journal (2018)	To assess and compare pre and post-operative perioral soft tissue changes of lip width, nasolabial and mentolabial angle using CBCT.	10 patients for evaluation requiring orthognathic surgical procedures maxillary or mandibular anteroposterior excess or deficiency, transverse deformities, vertical maxillary excess and facial asymmetry.	Using Three Dimensional Computed Tomography scan before and after surgery.	-Significant changes were observed in nasolabial angle after maxillary advancement (1.81°). -The mentolabial angle was significantly increased with mandibular setback procedures (3.27°).
10.	Vittert Katina et al.[16]	Int. J. Oral Maxillofac. Surg. (2018)	The aim of this study was to perform a Systematic analysis Of images from post Surgical orthognathic surgery.	40 orthognathic surgery patients were included, who underwent three different types of surgical correction: Le Fort I maxillary advancement, bilateral Sagittal split mandibular advancement, And bimaxillary advancement surgery.	Using 3d facial images of CBCT.	-The primary characteristic of the difference in shape was found to be residual mandibular prognathism in patients who underwent Le Fort I maxillary advancement.
11.	Kyung-A Kim et al.[5]	Progress in Orthodontics (2019)	To determine 3-dimensional soft tissue changes according to skeletal changes after mandibular setback surgery by using CBCT	Twenty-eight adult Korean patients with skeletal Class III malocclusion treated by mandibular setback were evaluated.	CBCT and facial scan images were recorded one week before and six months after surgery.	-In the transverse axis, there were significant changes and correlations in the lips and chin and an increasing gradient of ratios from the lower lip to the chin. In the anteroposterior axis, the lower lip and chin moved backward significantly. -In the vertical axis, significant upward movement was observed in the landmarks related to the chin.

IV. Discussion

Orthognathic correction of malocclusion is intended to improvise the overlying soft tissue discrepancies chiefly. Wherefore, estimation of soft tissue correction that will be achieved post movement of skeletal tissue following orthognathic surgery becomes crucial. In the present systematic review, soft tissue changes have been estimated using the studies which made use of the 3-dimensional x-ray imaging in orthognathic correction of class III skeletal base with Le Fort I maxillary advancement, bilateral sagittal split osteotomy with mandibular setback and a combination of both.

Three studies of the eleven evaluated the soft tissue changes post Le-Fort I advancement surgery, by Verdenik et al. (2014) using optical scans, Vittert et al. (2018) and Junho Jung et al.(2018) using 3-D facial images of CBCT have shown to acquire significant changes in the alar width, alar cinch,pronasale, subnasale, upper lip, chelion, labiale superius, crista philtri.[2,13,16] Study by Junho et al. have reported 2.4 mm of forward movement in point 'A'. In the upper lip, the percentage of the soft tissue movement compared to the bony movement was 14–31%. In the nasal area, the ratio was 18–48%, which was higher than the lip area. However, the nasal tip movement was the least among the nasal areas. The relative ratio of the soft tissue movement to the bony movement in the anteroposterior direction after Le Fort I advancement osteotomy was found to be 18% in the pronasale, 33% in the alar area, 29% in the alar cinch area, 21% in the labiale superius, 31% in the crista philtri, 47% in the chelion, 8% in the lateral vermilion border of the lower lip.[2]And the vertical parameters revealed that there was significant amount of lower facial height reduction.[13,16]

Six out of the 11 studies evaluated by Yong-Kyu Lim et al. (2010) using lateral cephalograms and 3-D facial scans, Bo-Ram Kim et al. (2013) using CBCT images, Verdenik et al. (2014) using optical scans, Vittert et al. (2018),Junho Jung et al.(2018) and, KyungA Kim et al. (2019) using 3-D facial images of CBCT assessed thesoft tissue changes following BSSO setback surgery.[2,5,6,11,13,16] Of the 6 studies, 2 studies, 1done by Bo-Ram Kim et al. which compared 1-jaw (mandibular setback) and 2-jaw (combination) and one by Junho Jung et al, which compared Le Fort I advancement and BSSO setback surgeries reported significant backward movement of soft tissue point B, labialeinferius and subnasale.[2,11] Junho Jung et al reported 4.85mm of point 'B' and 4.3mm of labialeinferius positioned backwards post surgery.[2] Two other studies, by Yong-Kyu Lim et al. and Kyung-A Kim et al., assessed soft tissue changes post mandibular setback in all the 3 planes of space.[5,6] In the transverse plane, significant changes were encountered in lips (labiale superius, stomion, chelion, labialeinferius) and chin (B', Pg', Me') but there was no significant change found in the nose and cheek region. In the sagittal plane, significant backward movement of lip and chin was evident (labiale superius, stomion, chelion, labialeinferius, Pg', B') but no change in the nose and cheek region. In the vertical plane, there was significant upward movement of chin (B', Pg', Me') and no change in the nose, lip and cheek. Significant decrease in the lower facial height (-2.17) and lip width (1.97) was evident.[5,6]And 2 studies by Verdenik et al. and Vittert et al. assessed all the three surgeries and reported significant changes in the nose, cheek and the upper lip areas in the combination group, however not significant. Lower lip and chin region showed significant changes in the BSSO and combination surgery groups. [13,16]

Six out of eleven studies assessed changes in response to bi-jaw surgery for correction of skeletal class III.[1,7,11,12,13,16]3 of the 6 studies by Lun-Jou Lo et al. (2018), Kyung-Min Oh et al. (2013) using volumetric images evaluated 2-jaw surgical correction of skeletal class III patients, Bo-Ram Kim et al. (2013) using CBCT images compared 1-jaw and 2-jaw surgeries and found significant changes in the upper lip, upper vermillion region and cheeks.[7,11,12] Bo-Ram et al. reported 1.5mm of forward movement of upper lip, 3mm of cheeks and 1.2mm of backward movement of chelion and 0.7mm by pronasale.[11] One study of the six, Hyoung-Seon Baik et al. (2010) evaluated soft tissue changes following 2- jaw surgery with and without genioplasty using 3-D laser scan reported no significant changes in the horizontal plane between the two groups. As presumed, Pg and Me movement was smaller in the group without genioplasty. In both the groups, inter-endocanthion distance, nasal width and lower two thirds significantly decreased and nasal prominence and transverse upper lip prominence significantly increased. On comparing pre and post-surgery, significant changes were seen in stomion, labialeinferius, B', Pg', Go'.[1] Only 2 of the 6 studies assessed by Verdenik et al. (2014) and Vittert et al. (2018), compared all the three surgical modalities undertaken for correction of skeletal class III using optical scans and 3-D facial images of CBCT respectively and reported significant changes in the nose, cheek and the upper lip areas following surgery, however not significant. Lower lip and chin region showed significant changes in the bi-jaw groups.[13,16]

V. Conclusion

The following conclusions can be made:

– Le Fort I advancement shows significant increase in the alar width, alar cinch, upper lip, chelion, labiale superius, crista philtri, pronasale and subnasale.

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– Mandibular setback shows significant backward movement of soft tissue point B, labialeinferius and subnasale and chin (B', Pg', Me').
– Bi-jaw surgery for skeletal class III correction shows significant backward movement of chelion, pronasale and lower lip region whereas nasal prominence and transverse upper lip prominence significantly increased.

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Postulation of the Effect of Unpredicted Predisposing Factors for Post-Tonsillectomy Bleeding

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Abstract- *Background and objectives:* Tonsillectomy is the most common surgical procedure in specialty of otorhinolaryngology. Therefore there are frequent premises regarding this procedure to be improved from different aspects, indications, time of surgery, techniques, safety measures, and postoperative care. Hence the tonsils and peritonsillar tissues are highly vascular zone that supplied by direct branches of external carotid artery thus the post-tonsillectomy bleeding remains one of significant issues in relation to this widely performed procedure. The post-tonsillectomy bleeding needs frequently to be postulated for its incidence, prevalence, etiology, predisposing factors, management and prevention. This subject constitutes one of most risky aspects that increase wariness of the surgeons regarding this commonly conducted procedure. Although there are huge numbers of presentative literatures coming from American as well as western institutes that tried to put guidelines for purpose of prevention and management of post-tonsillectomy bleeding but broadly at our middle-east region and locally at our Libyan society we found for some extent difficulties to apply all these guidelines. For this reason this issue has been take the wider spectrum of ENT surgeons' concentration, discussions, and researches.

Keywords: *post-tonsillectomy morbidity and mortality; post-tonsillectomy complications; post-tonsillectomy hemorrhage; post-tonsillectomy bleeding.*

GJMR-J Classification: *NLMC Code: WU 113*



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Postulation of the Effect of Unpredicted Predisposing Factors for Post-Tonsillectomy Bleeding

Khaled Mohamed Bofares

Abstract- *Back ground and objectives:* Tonsillectomy is the most common surgical procedure in specialty of otorhinolaryngology. Therefore there are frequent premises regarding this procedure to be improved from different aspects, indications, time of surgery, techniques, safety measures, and postoperative care. Hence the tonsils and peritonsillar tissues are highly vascular zone that supplied by direct branches of external carotid artery thus the post-tonsillectomy bleeding remains one of significant issues in relation to this widely performed procedure. The post-tonsillectomy bleeding needs frequently to be postulated for its incidence, prevalence, etiology, predisposing factors, management and prevention. This subject constitutes one of most risky aspects that increase wariness of the surgeons regarding this commonly conducted procedure. Although there are huge numbers of presentative literatures coming from American as well as western institutes that tried to put guidelines for purpose of prevention and management of post-tonsillectomy bleeding but broadly at our middle-east region and locally at our Libyan society we found for some extent difficulties to apply all these guidelines. For this reason this issue has been take the wider spectrum of ENT surgeons' concentration, discussions, and researches.

Therefore this study was conducted prospectively and for long time to confirm the possible predisposing factors that could be responsible for increasing the risk of post-tonsillectomy bleeding at our region and in the same time to illustrate the concluded recommendations to prevent the occurrence of this important complication.

Patients and methods: 2880 patients aged from 8 months to 85 years presented at ENT department- AL-hawari ENT and urology teaching center- Benghazi-city – Libya as well as AL-thowra central teaching hospital and AL-tarahom private center – Elbyda city – Libya at period in between September 2003 to March 2015 as cases of chronic adeno-tonsillitis and solitary acute as well as chronic related palatine tonsillar disease with variable patterns of indications for tonsillectomy namely snoring and apnea attacks, recurrent attacks of acute tonsillitis, persistent otitis media with effusion, recurrent attacks of acute suppurative otitis media, failure to thrive, recurrent attacks of chest infection, mal-occlusive dental deformity, unilateral enlarged tonsils, post-traumatic avulsed tonsils, history of quinsy abscess and persistent halitosis. All patients were assessed intra-operatively and post-operatively too for any evidences of primary, reactionary, or secondary hemorrhage in relation to wide spectrum of factors as patient's demographic, medical, and socio-habitual factors, in addition to technical as well as post-operative care factors.

Results: This presenting study confirmed that the most common type of post-tonsillectomy bleeding was the secondary variety (71%) as compared to primary (22%) and reactionary (7%) among all presented post-tonsillectomy bleeding cases. Although through this presenting serial study there were multifactorial pre-dispositions elucidated for secondary post-tonsillectomy hemorrhage but as general poor post-operative care can be considered as the cornerstone for the pathogenesis of this significantly raised incidence of secondary post-tonsillectomy bleeding this may be in form of inadequate patient's hydration and nutritional supply (47%), poor patient's antibiotic compliance (23%), and child's maternal negligence (19%). The time of surgery was found to be another important pre-disposing factor for post-tonsillectomy bleeding, it was postulated that the incidence of reactionary as well as secondary post-tonsillectomy hemorrhage significantly increased at summer and autumn seasons (69%) as compared to other seasons. The place of surgery was another interesting proposed studied factor among this serial presentation it was observed that the incidence of post-tonsillectomy bleeding among patients who operated at AL-hawari ENT and urology teaching center-Benghazi-city significantly higher (63%) than that among cases who interfered at AL-thowra central teaching hospital and AL-tarahom private center – Elbyda city.

Conclusion: Generally speaking, post-tonsillectomy bleeding is considered as one of important issues in ENT and one of significant post-tonsillectomy complications which may create a critical morbidity that may rarely extend to post-operative mortality. Hence the most common pattern of post-tonsillectomy bleeding is the secondary type; however this type of post-tonsillectomy hemorrhage is pre-disposed and induced by many factors. Most of these factors are treatable and curable thus the prophylaxis against this significant complication can be achievable.

Keywords: *post-tonsillectomy morbidity and mortality; post-tonsillectomy complications; post-tonsillectomy hemorrhage; post-tonsillectomy bleeding.*

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I. Introduction

Post-tonsillectomy bleeding (PTB) is considered as one of important issues at otorhinolaryngology which frequently speeds much time and effort for research activities due to its relation to most commonly performed procedure that is the tonsillectomy and hence PTB may create critical morbidities that may rarely extend to post-tonsillectomy death thus there will be always clinical trials to study the types, predisposing

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factors, causes, and suggestions for prevention and management of this significant complication [1-5 and 9-13]. Although there is wide spectrum of indications for tonsillectomy but among of all these indications there are certain conditions which may be associated with increased risk of PTB for instance the cases of previous quinsy abscess, tonsillar malignancy, acutely infected tonsils, and uncontrolled hemorrhagic tonsillitis [1-17]. On the other hand, almost of the contraindications for tonsillectomy are described on the basis of their significant relation to PTB and this relation could be direct relation by the action of those particular conditions as predisposing factors which may play a significant role for raising the incidence of PTB as bleeding disorders, acute infection, and menstruation, or indirect relation by increasing the morbidity and mortality after tonsillectomy due to the interaction between these conditions and PTB as patient's age under three years, patient's hemoglobin under 10g\100 ml, and uncontrolled systemic disorders as diabetes mellitus, systemic hypertension, cardio-vascular disorders, and renal impairment [1-23].

In addition, there are variable post-tonsillectomy complications which range between systemic to local, and early to late as complications of general anesthesia, aspiration to the lungs, negative pressure pulmonary edema, air way obstruction, local traumas, remnant tonsil, local infection, velopharyngeal dysfunction, and nutritional deficiencies [10 and 15]. Also all the complications of tonsillectomy can be discussed on the basis of their relation to PTB i.e. some of these complications have direct relation to PTB by their classification as significant etiologies for PTB as the local iatrogenic soft tissue traumas and local infection. In accordance, the other complications have opposite direct relation to PTB by the action of PTB as one of common predisposing factor for these complications as aspiration to the lungs, air way obstruction due to laryngospasm or large clot formation, chest infection, respiratory failure, cardiovascular shock, and disseminated intravascular coagulopathy. From the other view, there is other group of post-tonsillectomy complications which can be aggravated by PTB resulting in raised morbidity and mortality rates as dehydration, metabolic disturbances, and nutritional deficiencies [1-23].

Although there are three varieties of PTB, primary, reactionary, and secondary but the most common pattern is the secondary PTB as concluded by several previous studies [24-27]. This can be correlated to the improvement of tonsillectomy procedure recently from the patients' pre-operative care as well as the technology point of views resulting in low incidence of primary and reactionary PTB [24-27]. In accordance, hence the secondary PTB had been confirmed to be mainly due to the post-operative local infection thus there are multifactorial predispositions which may act as significant causes for post-operative infection at the tonsillar fossae as well as the peri-tonsillar area and subsequently the occurrence of secondary PTB. From the patient's age point of view, as it is well-established that the children with PTB will be at serious situations as compared to adults therefore the poor maternal post-operative care for the operated child can be considered as one of important predisposing factors for secondary PTB i.e. the negligence of child regarding maternal encouragement for early oral fluids and soft diets can be described as the cornerstone for child dehydration which leads to increased infective activity of local opportunistic flora due to reduced secretory immune capacity of the saliva by two mechanisms, first by decreased secretion rate of IgA through reduced saliva volume and the second by significant change of saliva PH. In addition, the poor sanitation as well as poor child's hygiene among low social class families with limited maternal education can be considered as other predisposing factors that may act toward the facilitation of pathogenesis of local infection [5-27].

On the other hand, there are other causes which can be categorized as important etiologies for PTB as bleeding disorders, remnant tonsillar tissue, stitch granuloma, local traumas, slipping of ligatures, diffuse fibrosis with difficult dissection, and pharyngo-laryngeal reflux but now days all these causes became of less significance by the improvement of pre-operative patient evaluation in addition to recent advancements as well as the developments in relation to tonsillectomy techniques. Although in spite of these improvements the incidence of secondary PTB is still found to be high thus the researching activities had been directed for assessment of postoperative conditions to postulate what could be the predisposing factors that responsible for the increased incidence rate of secondary PTB [5-37].

From our clinical observations at our Middle East society, we noted that the social as well as habitual factors are considered as another significant variety of secondary PTB predisposing factors. The maternal education, socioeconomic status, sanitation as well as hygiene conditions, and patients' psychological status were elucidated to play a significant effect on the incidence rate of secondary PTB. In addition, there are other co-morbid conditions with the palatine tonsillar disorders that may increase the risk of secondary PTB as uncontrolled allergic rhinitis as well as gastro-esophageal reflux disease (GERD). Thus this serial study was planned to achieve these aims:

a) To assess the effect of maternal education level on the secondary PTB incidence rate among operated children.
b) To postulate the effect of maternal and patients' psychological status on the secondary PTB incidence rate among operated children as well as adult patients consecutively.

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c) To elucidate the effect of sanitation and hygiene conditions on the secondary PTB incidence rate among operated patients.
d) To confirm the effect of socioeconomic status on the secondary PTB incidence rate among operated patients.
e) To illustrate the effect of co-morbid disease conditions namely allergic rhinitis and GERD on secondary PTB incidence rate among operated patients.

II. Patients and Methods

2880 patients aged from 8 months to 85 years presented at ENT department- AL-hawari ENT and urology teaching center- Benghazi-city – Libya as well as AL-thowra central teaching hospital and AL-tarahom private center – Elbyda city – Libya at period in between September 2003 to March 2015 as cases of chronic adeno-tonsillitis and solitary acute as well as chronic related palatine tonsillar disease with variable patterns of indications for tonsillectomy namely snoring and apnea attacks, recurrent attacks of acute tonsillitis, persistent otitis media with effusion, recurrent attacks of acute suppurative otitis media, failure to thrive, recurrent attacks of chest infection, mal-occlusive dental deformity, unilateral enlarged tonsils, post-traumatic avulsed tonsils, history of quinsy abscess and persistent halitosis. All patients were assessed intra-operatively and post-operatively too for any evidences of primary, reactionary, or secondary hemorrhage in relation to wide spectrum of unpredicted factors namely, patients' socio-economic, habitual, sanitation, housing, and hygiene factors. In addition, the patients' medical status namely severity of co-morbid allergic rhinitis as well as pharyngo-esophageal reflux and uncontrolled psychiatric status were considered as other significant factors which also evaluated in relation to incidence of PTB. An informed consent was taken from the parents of all operated children or from adult patients themselves involved in the research prior to their participation.

Data were expressed by using descriptive analysis as means $\pm$ standard error of mean (s. e. m) and percentages, test of significance was curried out, using Chi-squar test and two way analysis of variance. A probability less than 0.05 was considered as significant, the degree of significance was determined by using level of standard deviation test. Student -t- test was used for dependent sample, as well as contingency coefficient was calculated as measurement of association between nominal variable.

III. Results

The Figure-I showed significant raising of the incidence of secondary PTB among operated children who cared by poorly educated mothers as compared to those who are under postoperative care by well-educated mothers ($P < 0.1$). Figure-II illustrated significant elevation of the incidence of secondary PTB among operated children with psychiatrically abnormal mothers as well as among adults who are known cases of variable psychiatric problems ($P < 0.1$). On the other hand, Figure-III demonstrated that there is significant increase of the incidence of secondary PTB among operated patients who are living with big sized families [family members > five] as compared to others ($P < 0.1$). In accordance, Figure-IV represented that the incidence of secondary PTB was significantly increased among operated patients who have poor sanitation at their houses as compared to those with good sanitation ($P < 0.1$). In addition Figure-V demonstrated significant elevation of the incidence of secondary PTB among patients with low socioeconomic status as compared to others ($P < 0.1$). From the other view, Figures VI and VII showed significant increase in the incidence of PTB among patients with co-existing uncontrolled allergic rhinitis and uncontrolled GERD consecutively ($P < 0.1$).

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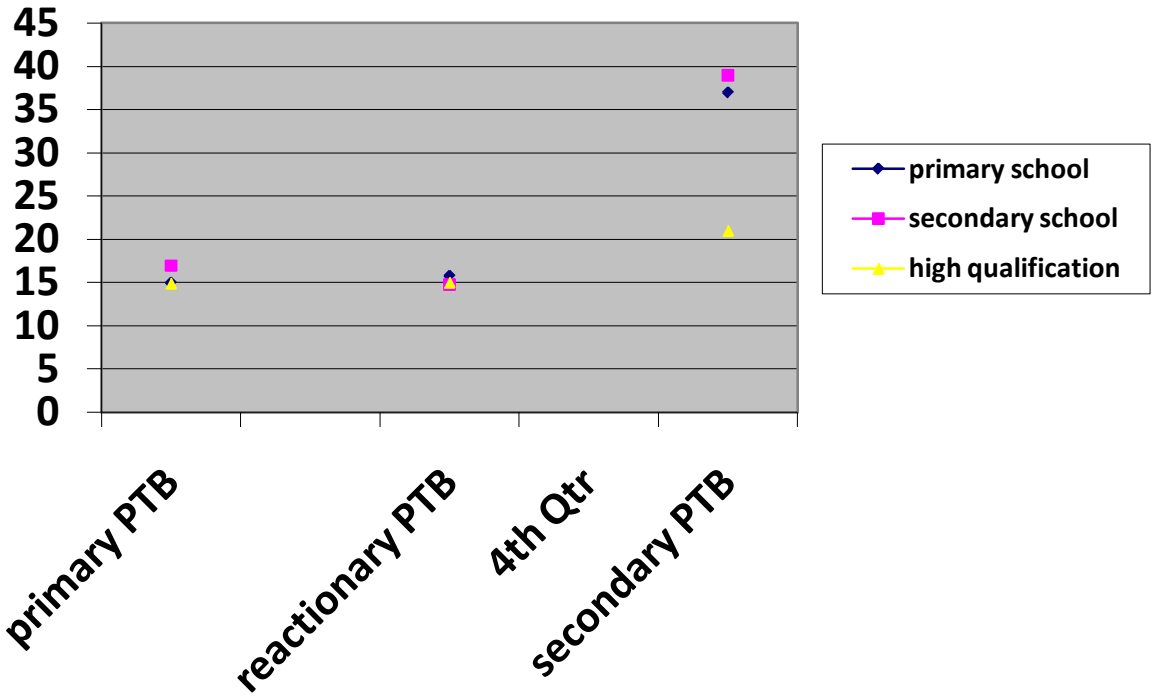


Figure I: The relationship between maternal education level and PTB incidence rate among operated children ($P < 0.1$).

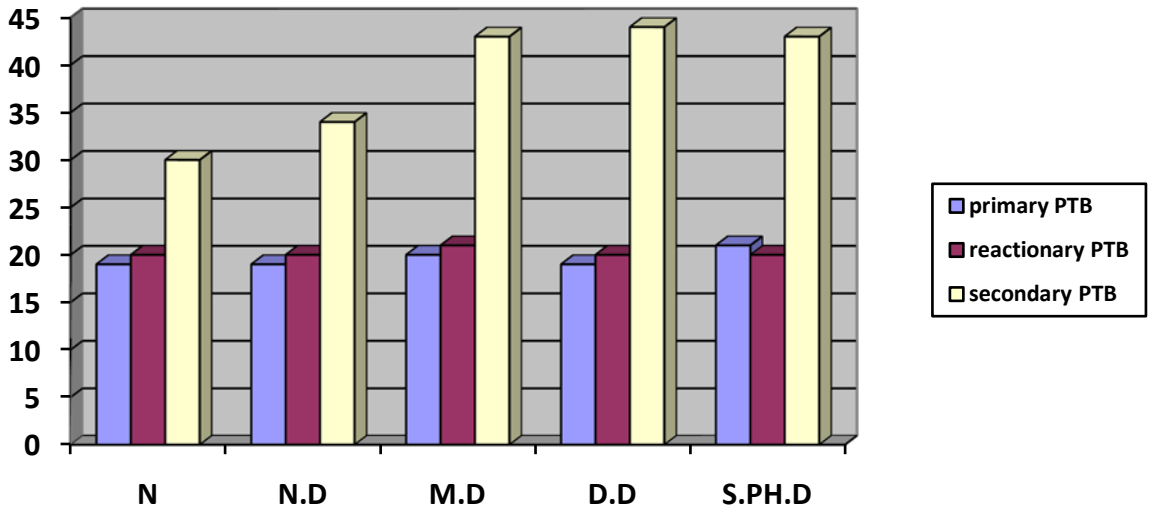


Figure II: The effect of maternal and patients' psychological status on the PTB incidence rate among operated children as well as adult patients consecutively. (N= normal psychological status, N.D= neurotic disorders, M.D= manic disorder, D.D= depression disorder, S.PH.D= schizophrenic disorder), ($P < 0.1$).

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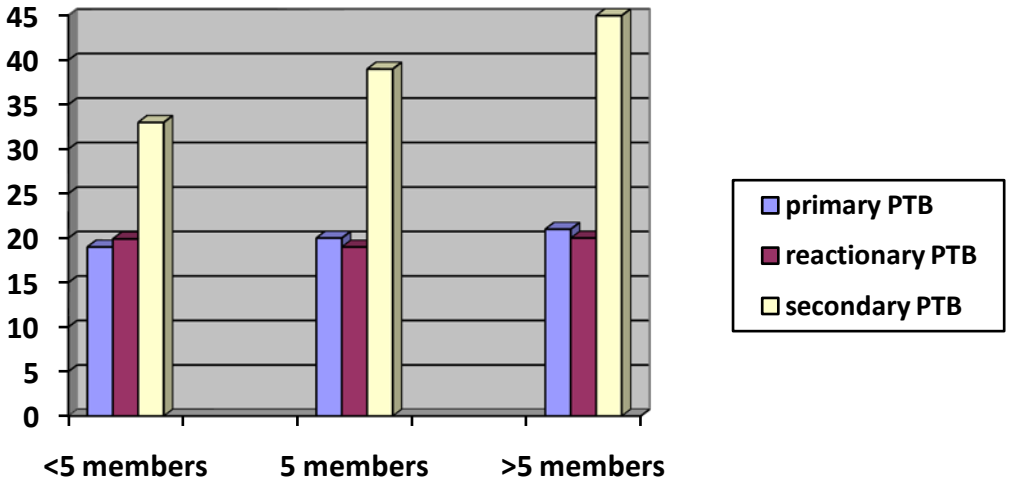


Figure III: The relationship between patient's family members number (<5, 5, and >5 members) and PTB incidence rate among operated children (P < 0.1).

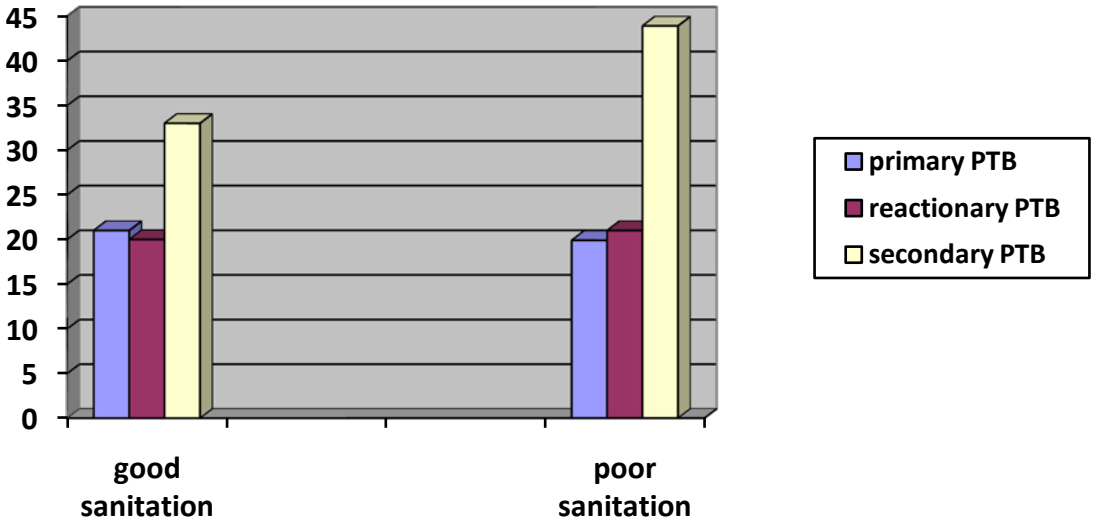


Figure IV: The relationship between sanitation status [good sanitation= family members < five members and house with > two rooms, poor sanitation= family members ≥ five members and house with ≤ two rooms] and PTB incidence rate among operated patients (P < 0.1).

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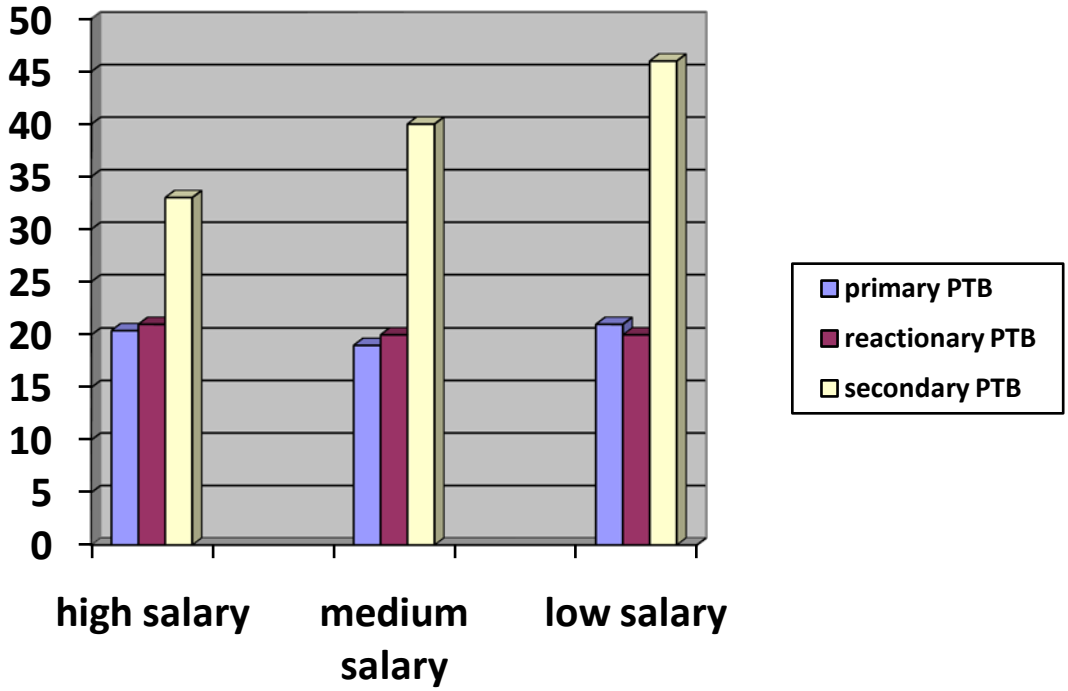


Figure V: The relationship between patients' family economic status [high salary= >2500LD (~ >1000$), medium salary= 1000-2500LD (~400-1000$), and poor salary= <1000LD (~ <400$)] and PTB incidence rate among operated patients (P < 0.1).

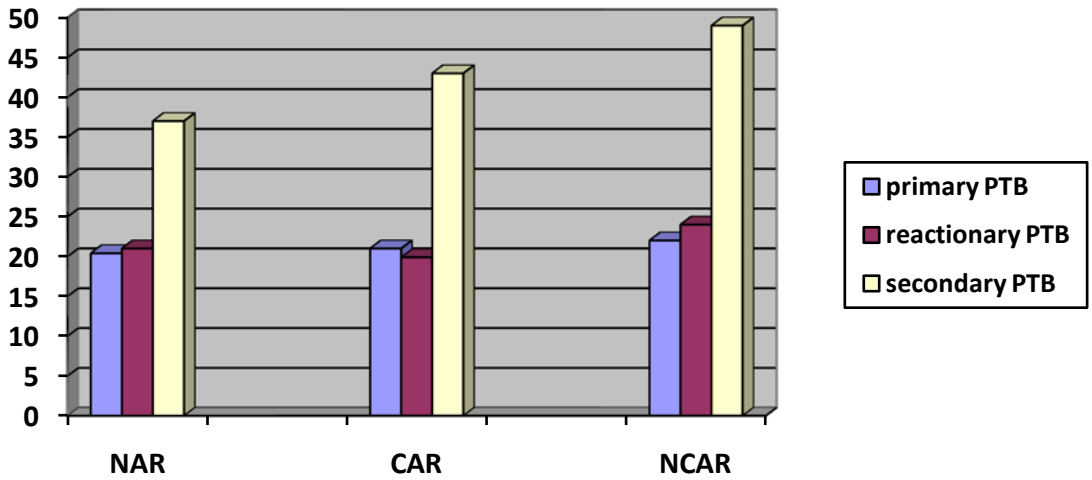


Figure –VI: The relationship between co-existence of allergic rhinitis and PTB incidence rate among operated patients (P < 0.1). [NAR=no allergic rhinitis, CAR=controlled allergic rhinitis, and NCAR=uncontrolled allergic rhinitis].

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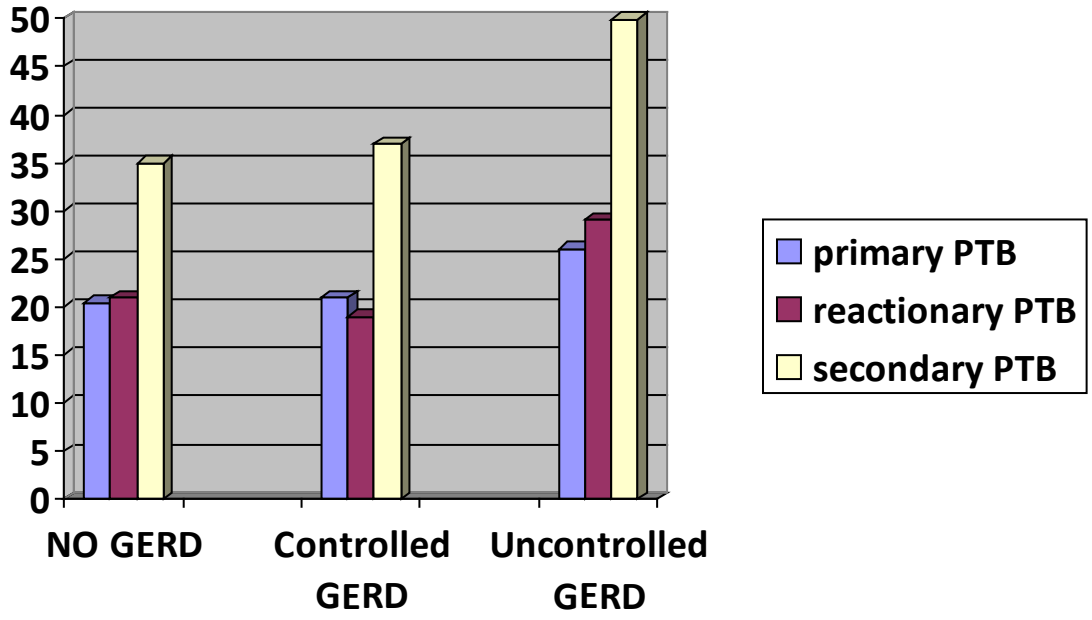


Figure –VII: The relationship between co-existence of GERD and PTB incidence rate among operated patients ($P < 0.1$).

IV. Discussion

Although by the progress of the sciences and further development of the surgical technology at this presenting century; still the incidence of PTB is significantly high [24-27]. This can be shown via several well- controlled clinical studies. This means that there are other possible suggested factors rather than technical or medical factors which could play a significant role regarding predisposition for PTB. Hence the secondary PTB constitutes most common variety as compared to primary and reactionary thus this confirm that the technical as well as the medical factors have minimal consideration as etiological factors for PTB because these factors had been elucidated to be bothersome factors of primary and reactionary PTB. Therefore it becomes very necessary to research and illustrate for other possible predisposing factors [5-32].

At this serial clinical prospective study we suggested a cluster of certain new pattern of factors which could be unpredicted. This manner of factors is more related to social status of the patients rather than their demographic or medical criteria. In accordance and from our clinical observations we noted that these unpredicted groups of factors play a very significant role in estimation of incidence rate of secondary PTB. The education level of operated child's mother can be considered as one of these important factors it was elucidated that the improvement of maternal as well as patient education level will reduce significantly the incidence rate of secondary PTB among operated children and adults consecutively. This can be correlated to the degree of post-operative care in relation to the education level i.e. the improvement of education level will be reflected positively on the maternal and patient understanding for the importance of encouragement for early oral feeding by cold fluids as well as soft diets, restricted compliance for post-operative prescribed medication administration particularly analgesics as well as antibiotics, and post-operative close observations regarding persistent fever, repetitive vomiting, latency, fatigability, malaise, persistent dysphagia, persistent odynophagia, and PTB [33, 34, 38 and 39].

On the other hand, the maternal as well as patients' psychological status was affecting significantly the incidence rate of secondary PTB among operated children and adult patients consecutively. This can be explained by the increase of post-operative negligence and carelessness proportionally with worseness of co-existing psychological disorders. The mothers with manic, depressant, or schizophrenic psychotic disorders had been shown poor compliance regarding frequency of post-operative fluids and soft diets administrations to their operated children; in addition those mothers had been presented significantly a higher rate of post-operative analgesics as well as antibiotics missing to their operated children. The same observations were elucidated among operated adults with manic, depressant, or schizophrenic psychotic disorders. Therefore this can result in significant rising of secondary PTB as predisposed by uncontrolled dehydration and infection.

From the other view, there is another unpredicted and masked predisposing factor for secondary PTB which is the sanitation and hygiene status of the environment where the operated patient is living. From the primary health care point of view, the

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sanitation status can be classified on basis of number of family members in relation to their house rooms number into two categories, good sanitation which is defined by family members number less than five who are living at house contains more than two rooms, and poor sanitation which is indicated by family members number of five or more who are living at too small house that composed of two rooms or less. The presented study postulated that the incidence rate of secondary PTB was significantly increased among operated patients who are living at poor sanitation. This can be reasoned by the increase of incidence rate of post-tonsillectomy infection at environments with poor sanitation due to overcrowding as well as bothersome negligence, carelessness and bad hygiene. In accordance, it was found that if the operated child living with both parents this shown significantly decreased incidence rate of secondary PTB as compared to the other situations when the operated child living with one parent or other relatives rather than parents as grandfather, grandmother, uncle, or aunt.

At developing countries there is another factor which could be suggested as important unpredicted predisposing factor for secondary PTB that is the patients' socio-economic status. It was noted that the incidence rate of secondary PTB significantly higher among operated patients who had been classified at the category of low socio-economic status as compared to other patients who already categorized at high socio-economic class. The income per month was considered as main indicator that had been used for this process of categorization i.e. those patients have been considered as high socio-economic status they got more than 2500LD (~ >1000$) as salary per month, in accordance those who classified as medium socio-economic status they had 1000-2500LD (~400-1000$) as salary per month, and the patients with poor socio-economic status their salary per month was less than 1000LD (~<400$). The effect of patient's socio-economic status on incidence rate of secondary PTB can be distinguished from the co-existence of limited education levels, poor sanitation conditions as well as bad hygiene circumstances in association with poor socio-economic status. This may affect obviously the post-tonsillectomy care which is the main determinant for post-tonsillectomy nutritional insufficiencies, dehydration, and infection.

Surprisingly there was another factor thought to act as unpredicted predisposing factor for secondary PTB this is the seasonal time of surgery performance. It was confirmed that the incidence rate of secondary PTB higher during summer and autumn seasons as compared to winter and spring seasons. This can be explained by the fact that the risk of postoperative dehydration is significantly increased during summer as well as autumn classes as compared to other two classes this might be due to interaction of two reasons: a) the minimal oral fluids requirements of the patient after tonsillectomy could not be reached because of postoperative odynophagia, and b) the increase of body fluids loss during summer and autumn classes due to excessive sweating as the result of hot climate exposure with insufficient compensation of this loss by needed oral fluids as a sequel of co-existing post-tonsillectomy pain.

On the hand, it was found that the patients who had co-morbid allergic rhinitis were susceptible for secondary PTB as compared to non-allergic patients this should be discussed by the persistence of post-operative mouth breathing as the result of congested nose with or without hypertrophied turbinates as pathognomonic changes of allergic rhinitis. The concomitant mouth breathing will result in uncontrolled oral dryness that predispose for local infection this might be due to two suggested reasons: a) the oral dryness means decrease of secreted saliva volume this resulting in the significant dropping of secretory immunoglobulin (IgA) level that lead to activation of opportunistic oral cavity flora and b) the reduction of saliva secretion might be considered as a significant cause for the disturbance in normal oral cavity alkaline PH this also may contribute to overgrowth of certain strains of normal oral cavity flora or increase the risk of exogenous opportunistic infections.

In accordance, it was elucidated that the patients who had been diagnosed as GERD shown significantly higher risk of secondary PTB as compared to other patients this should be correlated to: a) gastric acidity direct effect: the secondary PTB occurs as the result of local reactive acute inflammatory changes to chemical effect of gastric juice, and b) gastric acidity indirect effect: this mainly due to the significant dropping in the alkaline buffering oropharyngeal PH that lead to the important variation of normal oropharyngeal flora and subsequent infection by the opportunistic microorganisms.

Comprehensively, there was another important factor which had been suggested to be as significant predisposing factor for secondary PTB this is the way of presentation for postoperative instructions by the medical staff and to who these instructions are given. It was noted that if the postoperative instructions are given to the patients as written file rather than verbal description this will reduce significantly the risk of secondary PTB. In accordance if the postoperative instructions are given to patients' mothers or patients themselves among operated children and adult patients consecutively rather than they are given to other patients' relatives as fathers, grandfathers, grandmothers, brothers, sisters, uncles, aunts, or friends this will create a significant improvement in the incidence rate of secondary PTB.

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Although among this serial study we tried to highlight the effect of some of suggested unpredicted factors which may play a significant role in determination of incidence rate of secondary PTB but we think that further formative studies are recommended to confirm our results at different media and environments also other possible factors which not studied yet can be thought and postulated.

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2. Authors must accept the privacy policy, terms, and conditions of Global Journals.
3. Ensure corresponding author's email address and postal address are accurate and reachable.
4. Manuscript to be submitted must include keywords, an abstract, a paper title, co-author(s') names and details (email address, name, phone number, and institution), figures and illustrations in vector format including appropriate captions, tables, including titles and footnotes, a conclusion, results, acknowledgments and references.
5. Authors should submit paper in a ZIP archive if any supplementary files are required along with the paper.
6. Proper permissions must be acquired for the use of any copyrighted material.
7. Manuscript submitted *must not have been submitted or published elsewhere* and all authors must be aware of the submission.

Declaration of Conflicts of Interest

It is required for authors to declare all financial, institutional, and personal relationships with other individuals and organizations that could influence (bias) their research.

Policy on Plagiarism

Plagiarism is not acceptable in Global Journals submissions at all.

Plagiarized content will not be considered for publication. We reserve the right to inform authors' institutions about plagiarism detected either before or after publication. If plagiarism is identified, we will follow COPE guidelines:

Authors are solely responsible for all the plagiarism that is found. The author must not fabricate, falsify or plagiarize existing research data. The following, if copied, will be considered plagiarism:

- Words (language)
- Ideas
- Findings
- Writings
- Diagrams
- Graphs
- Illustrations
- Lectures

- Printed material
- Graphic representations
- Computer programs
- Electronic material
- Any other original work

Authorship Policies

Global Journals follows the definition of authorship set up by the Open Association of Research Society, USA. According to its guidelines, authorship criteria must be based on:

1. Substantial contributions to the conception and acquisition of data, analysis, and interpretation of findings.
2. Drafting the paper and revising it critically regarding important academic content.
3. Final approval of the version of the paper to be published.

Changes in Authorship

The corresponding author should mention the name and complete details of all co-authors during submission and in manuscript. We support addition, rearrangement, manipulation, and deletions in authors list till the early view publication of the journal. We expect that corresponding author will notify all co-authors of submission. We follow COPE guidelines for changes in authorship.

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Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

Declaration of funding sources

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Preparing your Manuscript

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.



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Format Structure

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for writing a good quality Medical Research Paper

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of medical research then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.



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6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.



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Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



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Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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