International Journal Dental and Medical Sciences Research (IJDMSR)
ISSN: 2393-073X Volume 2, Issue 9 (Sep- 2018), PP 25-30
www.ijdmsr.com

Surgical Options In Obstructive Sleep Apnoea

Dr. Mukund Gupta[1], Dr. P Mehra[2], Dr. Nupur Gogia[3]
[1]*Reader, Department of Oral and Maxillofacial Surgery, KDCRC*
[2]*Prof and HOD, Department of Dental and Oral Surgery, LHMC*
[3]*Reader, Department of Oral Medicine and Radiology, KDCRC*
**Corresponding Author: Dr. Mukund Gupta*

I. INTRODUCTION

Of the chronic life style diseases that have rapidly grown and slowly turned into epidemics, obstructive sleep apnoea seems to be right at the top of charts. This change no doubt is fuelled by better research towards marking the clinical features, investigative procedures and the plethora of management options at various levels. OSA is a potentially life threatening condition characterised by abnormal breathing in sleep and sleep fragmentation. OSA can lead to hypoxemia, hypercarbia, systemic and pulmonary hypertension, polycythemia, corpulmonale, bradycardia, and cardiac dysrhythmias besides reducing the quality of life 1. A diagnostic evaluation includes a thorough history and physical examination, fiberoptic endoscopy, radiologic evaluation, and polysomnography. The aim of evaluation is to delineate an anatomic space which may be responsible for OSA. Cephalometric analysis allows for a low cost with minimal radiation exposure technique to identify any skeletal and soft tissue abnormalities that may exist. Once the medical options of management have shown no significant benefits or when OSA is primarily a surgical challenge , surgical options for the management span a long list that are aimed at enlarging or stabilising the upper airway. These procedures can be classified as nasal, upper pharyngeal, lower pharyngeal and global upper airway procedures. The aim of this paper is to give an overview of the various surgical procedures involved in the management of OSA.

Surgical Procedures

The procedures used in the surgical treatment of obstructive sleep apnea can be divided into emergency airway support procedure (Tracheostomy) , Nasal procedures, palatal procedures (UP3,LAUP,RFA,implants) ,Tongue procedures(tongue reduction, tongue lip adhesion ,genial advancement) ,Hyoid procedures (hyoid advancement, hyoid suspension) and orthognathic surgical procedures(Conventional Maxillomandibular advancement procedures ,Genioplasty, Distraction osteogenesis)1. Selection of the individual procedure is determined by the severity of the sleep apnea, the presence of a maxillofacial skeletal deficiency, the site of the obstructive segment, and the presence of morbid obesity. Any surgical procedure requires a good anaesthesia .There have always been doubts regarding severity of OSA and its association with difficulties in intubation. Nelligan et al did a prospective study to evaluate the same and found no significant correlation between OSA and difficulty in intubation/laryngoscopy2,3. However cases with severe retrognathiaretrognathia/ micrognathia or mouth opening difficulties must always be thoroughly evaluated and alternate plans for airway management must be discussed within the surgical and anaesthetic team.

Emergency Airway Management - Tracheostomy

Tracheostomy as a procedure by-passes the upper airway and therefore reduces the resistance offered by the same. At the same time the advantages offered by the upper airway of moistening , thermoregulation and filtering are lost. Tracheostomy as a procedure for management of OSA ,in light of the recent surgical advances should only be considered in the most severe cases and there also, as a temporary stop gap solution. The morbidity and mortality associated with the procedure are very steep and limits its use to cases with laryngomalacia or tracheomalacia complicating the OSA. Tracheostomy may indeed be required during peri operative airway support when planning and executing a definitive surgical treatment such as distraction osteogenesis for maxillomandibular advancement in severe OSA cases.

Fujita Classification system2

Before any further discussion on the surgical management one has to clearly define the site or sites where any intervention is warranted for the correction of OSA.Fujita classification is commonly used to perform the above mentioned task. The classification is carried out via diagnostic nasopharyngoscopy via using Mueller Manoeuvre and observing airway space during inspiration with a closed mouth and nose

Fujita 1 - obstruction at the level of nasopharynx and oropharynx
Fujita 2a - obstruction primarily at oropharynx
Fujita 2b - obstruction primarily at hypo-pharynx

Fujita 3 - obstruction at the base of hypo-pharynx

Nasal Procedures

Done in case with Fujita 1 level obstruction. Primarily include nasal polyp excision, Nasal turbinate reduction and septal corrections 4,5.Increased air speed and diminished airflow resulting from tissue collapse at the site of deviated septum is a potential site for obstruction and requires. Septoplasty however must be done with caution, a 1 cm rim of cartilage should always be left on the septum otherwise the entire nasal collapse is inevitable.

II. PALATAL PROCEDURES

These include uvulo palato pharyngoplasty (UP3 Figure1), Laser assisted UP3, Radio-frequency the rmablation, Palatal implants and palatal expansion incase of severely constricted palatal arches 1,5.UP3 involves surgical resection of the mucosa and submucosa of the soft palate, tonsillar fossa, and the lateral aspect of the uvula . The amount of tissue being removed is tailored to the patients requirement for creating adequate space so as to prevent OSA. Laser assisted uvulo-palatoplasty generally uses carbon dioxide laser for removal of uvula and part of the associated soft plate. it is typically different from UP3 in that the lateral walls are spared . The typical advantages of bloodless surgery with faster healing of the operated site , less scarring and lesser need for analgesia prevail. Radio-frequency thermablation uses thermal probes that are inserted within the soft palatal musculature and uvula and thereby causing fibrosis and scarring internally rather then then on the surface as done in LAUP. the internal fibrosis reduces the soft palate length as well as mobility thereby increases the posterior airway space and combats OSA. Palatal stiffening procedures include insertion of palatal implants, injection of a sclerosing agent or a cauteryassisted palatal stiffening operation (CAPSO). The CAPSO procedure uses cautery to induce a midline palatal scar designed to stiffen the soft palate to eliminate excessive snoring. The palatal implant device is a cylindrical-shaped segment of braided polyester filaments that is permanently implanted submucosally in the soft palate. Scar contracture at the posterior border of the soft palate can create a "curtain" effect, pulling the soft palate downward against the tongue and causing significant transverse narrowing between the posterior faucial pillars, further contributing to OSA. Therefore the results of palatal stiffening and scarring along with UP3 have not been equivocally good.

Hypertrophied tonsillar and adenoid tissues can contribute to airway obstruction at the nasopharyngeal and oropharyngeal levels, especially in children and adolescents and hence may sometimes need removal i.e. Tonsillectomy and adenoidectomy.

III. TONGUE PROCEDURES

Tongue is major special organ for speech and taste sensation occupying a large area in the oral cavity and the oropharynx. True Macro-glossia (when the tongue size is actually big) requires partial glossectomy (Figure 2) for size correction either alone or in conjugation with other procedures (improvement shown in 25 to 83% cases) 4,5. Relative or pseudo macro-glossia should ideally be treated via maxillo- mandibular advancement or expansion for correction. Tongue positioning procedures include glossopexy which are of immediate benefit especially when combined with other procedures including soft palate (UP3) is especially useful in infants and children. Glossopexy better known as tongue lip adhesion involves securing the tip of tongues to the labial mucosa of the lower lip. Deep bite through the tongue musculature which prevents tearing of the tongue tissue is warranted for the procedure. Possible complications associated with the procedure include massive floor of the mouth hematoma due to injury and subsequent compression of the floor of the mouth and ventral tongue vasculature, dehiscence of tongue and scarring of the lower lip. At best it acts as an intermediated procedure that buys the surgeon time before any definitive corrective measure could be put in place for the correction of OSA. Sub-periosteal floor of mouth release allows the tongue to move forward and in a downward direction thereby improving the airway obstruction caused by retruded and elevated tongue position especially in infants .This procedure however has gone out of favour because of the unpredictable improvement and life-threatening bleeding in floor of the mouth region Another tongue advancement procedure - genial tubercle advancement is explained in the subsequent orthognathic procedure.

IV. HYOID PROCEDURES

Done in isolation or in combination with genial advancement and other soft palate procedures, Hyoid procedures primarily aim at advancing the hyoid bone anteriorly and superiorly thereby correcting the obstruction at the level of hypo-pharynx.

Hyoglossus is the main muscle that is involved. Varying literature put the surgical benefit at 40-70 % provided the site of obstruction is mainly at the hypo-pharynx level.Recent reports of using a Screw based (Repose Hyoid Suspension) hyoid advancement have also shown promising results. Repose screws have an attached suture

material in the screw head, once anchored in the genial tubercle region the sutures can used to suspend the the hyoid towards the genial tubercle in an advanced position.

V. GENIAL PROCEDURES

Genial tubercle advancement (Figure 3) is accomplished by making a bony window through the buccal cortex at the symphysis of mandible region with the aim of getting the genial tubercles with their muscle attachments fall on the lingual cortex within the window. This is then advanced and secured with the help os screws so as to allow the genial tubercles to reach upto the buccal cortex of the mandible. The anterior portion of the bone block is sacrificed to maintain the smooth contour of the chin.This procedure advances the genioglossus attachment by almost the full thickness of the mandible (~10mm).

Conventional advancement genioplasty procedures with the modification that the genial tubercles be included in the advanced segment can also be used for genioglossus advancement.Though surgically less challenging compared to isolated tubercle advancement procedures ,conventional advancement genioplasty procedures alters the lower mandibular chin profile and therefore brings an alteration in the facial profile which may not be warranted in all the patients.Combined with hyoid advancement and suspenion , genial procedures have shown improvement in 40 to 70 % of the case with mild to moderate OSA. Severe OSA cases have shown a much lower improvement with these procedures alone.

Maxillo- Mandibular advancement (MMA Figure 4,5)

This mostly involves a combination of lefort 1 osteotomy of maxilla , bilateral saggital split osteotomy of mandible and osseous genio plasty allowing for forward placement of each of the components that are held in their position via the use miniplates and screws 6.These procedures lead to complex changes in the aesthetics as well as the occlusion of the patient and therefore have to be discussed and explained in detail to the patient.In children and in cases with severe shortening the advancement can be done more gradually with the help of distraction osteogenesis. Distraction osteogenesis being slow but more physiological means of advancement associated with lesser relapse and allows for adjustments at various stages of the procedure to suit the needs to a particular patient 3.West et al In 1979 were first to document mandibular advancement for the correction of OSA. Later Riley et al advocated simultaneous MMA for achieving long term benefits for correction OSA. The exact guidelines for the amount of advancement varies from individual to individual and have to be evaluated pre operatively via cephalometric as well as model analysis 7.Fujita type 2 and 3 cases are ideally suitable for maxillo-mandibular advancement procedures. MMA for correction of OSA differs from conventional procedures for aesthetic correction because myotomy / muscle separation from the bone must never be done when correcting OSA as this would lead to fall back of the soft tissues with a resultant narrowing of the airway. Absence of hypo pharyngeal narrowing such as sole velopharyngeal narrowing (Fujita 1) is a contraindication of MMA procedure. Waite et al 8 operated on 23 PSG proven cases of OSA via MMA procedure and showed excellent result in 96% of the cases. Holty et al 6 through there meta analysis have shown maxillomandibular advancement to be successful in 40 - 100% of OSA cases that are moderate to severe. Prinsell 9,10 published a review of literature regarding MMA and OSA and showed 88.4% reduction in AHI for primary (where MMA was the first surgery) MMA AND 86.6% reduction in Secondary MMA (MMA done after other surgical procedures). A 92.1% AHI reduction was achieved via simultaneous Primary MMA and other extra-pharyngeal procedures

Weight reduction surgery

Bariatric surgery as well as liposuction has shown definitive improvement in OSA patients that are moderate to severally obese 11.Obesity at large continues to be a major cause of OSA and requires lifestyle modifications for long term beneficial results.

VI. CONCLUSION

OSA is complex condition that is slowly increasing and reaching epidemic proportions. The management as like its aetiology is multifactorial. With the current advances in the understanding of OSA a "toolbox" approach i.e. doing the procedure that most suits the patient is warranted.Convention medical and physiological procedures do have there place in the management but surgical options should not be looked with suspicion .As a prerequisite for surgical treatment patient must have clinically significant OSA with AHI >15 ,where conservative treatment have failed or have not shown good results.The patient must be made aware of the surgical risks and complications and must be willing to undergo the surgery.For surgeries requiring frequent visits like distraction osteogenesis patient co-operation and understanding is of utmost importance as the results are gradual and initial efforts are very taxing.It goes without saying that for patients with obstruction at multiple sites , surgeries must be sequenced generally extrapharyngeal skeletal muscle advancement and stabilisation first and subsequent intra pharyngeal soft tissue procedures.Overall a detailed and comprehensive plan tailored to the patient must be made with close post operative monitoring and follow up.MMA has shown excellent results with or without other surgical procedures and should always be considered as an option.

FIGURES

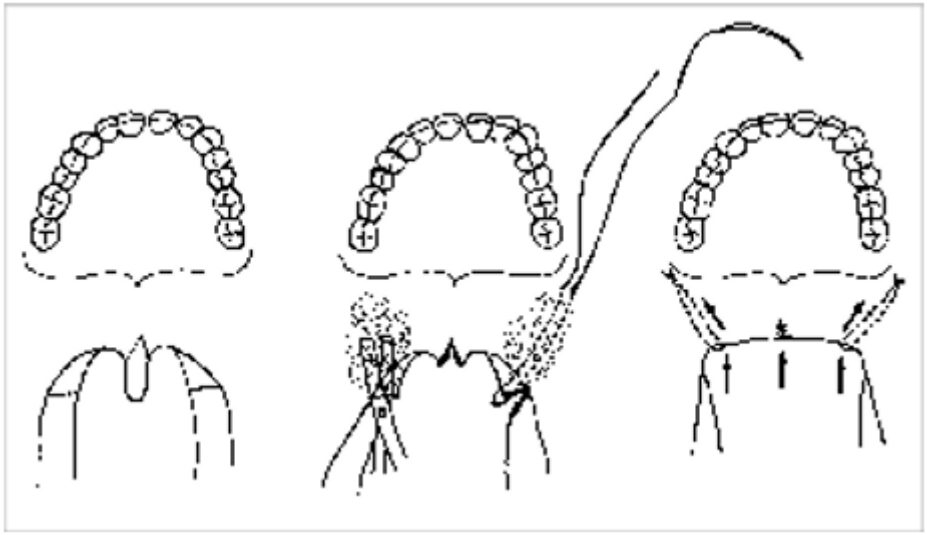

Figure 1. Uvulo-palato-pharyngo-plasty technique

Figure 2. Tongue reduction surgery

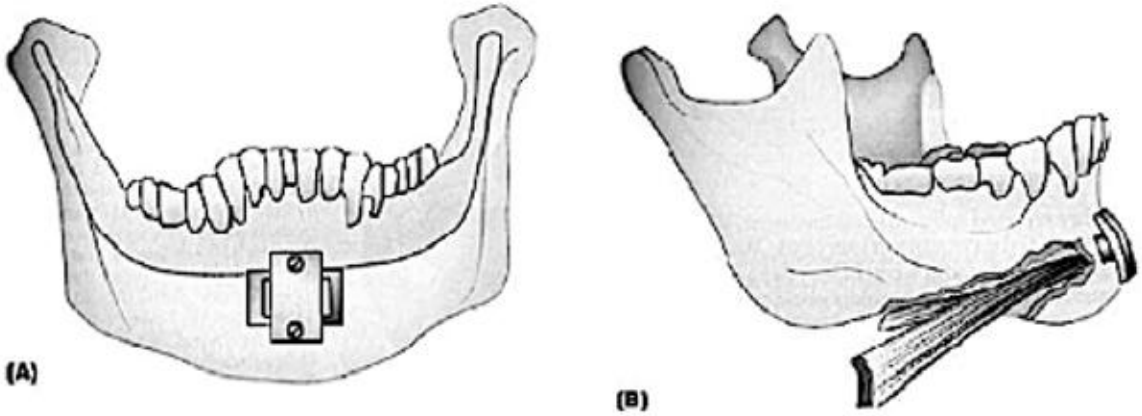

Figure 3. Genial advancement
a. frontal view of advanced anterior genial segment window containing the genial tubercle.
b. lateral view depicting the advancement of the muscle

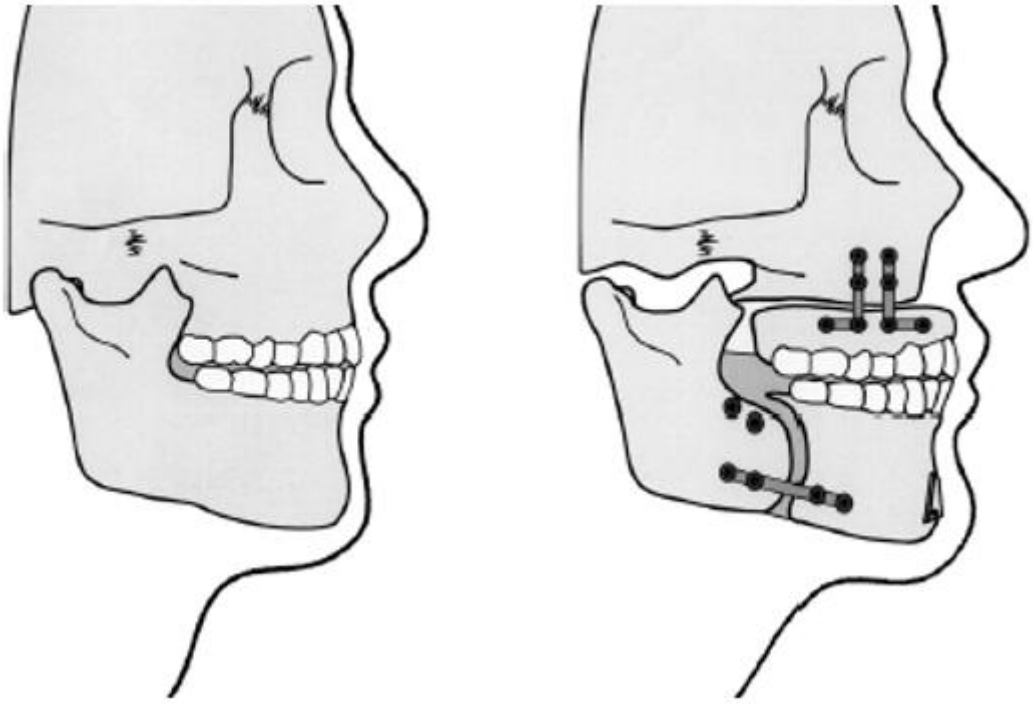

Figure 4. Maxillo-mandibular advancement

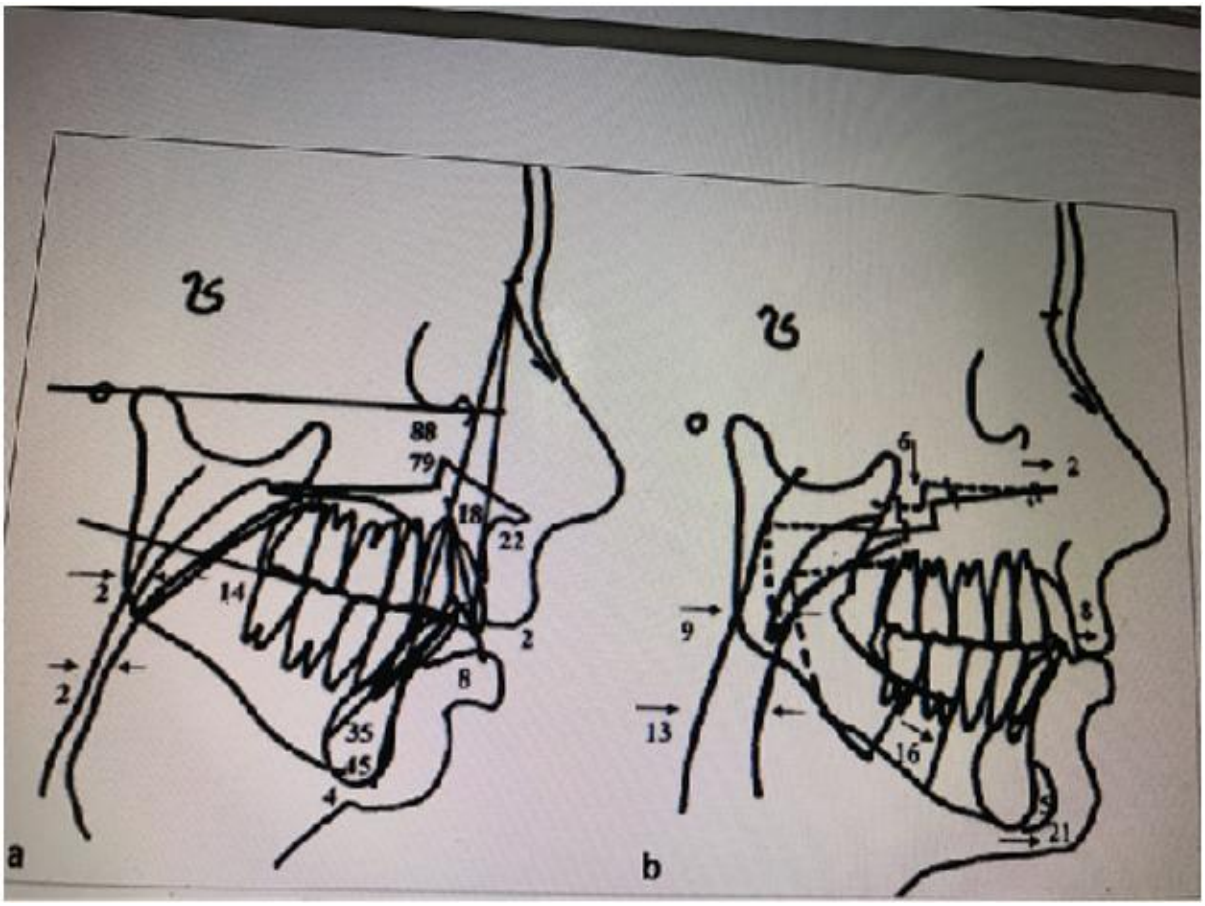

Figure 5. Cephalometric tracing a.pre operative b. post operative after maxillo-mandibular advancement showing increase in the posterior airway space.

REFERENCES

[1]. Tatiana de Aguiar Vidigal, Fernanda Louise Martinho haddad Luiz Carlos Gregório, Sergio Tufik, Lia Rita Azeredo Bittencourt. Review of surgical treatment in Obstructive Sleep Apnea Syndrome.Sleep Sci. 2011;4(1):2

[2]. Fujita S.Obstructive Sleep Apnea Syndrome: pathophysiology , upper airway evaluation and surgical treatment.Ear Nose Throat Journal 1993:72(1)67-72

[3]. Reza Jarrahy.Controversies in management of neonatal micrognathia : to distract or not to distract that is the question.Journal of Craniofacial Surgery, 2012;23(1):243-249

[4]. PUSHKAR M, LARRY M W .Surgical Management of Obstructive Sleep Apnea.Baylor University Medical Center Proceedings,2000:13(4):338-342

[5]. Sean M C,James A R.Surgical Modifications of the Upper Airway for Obstructive Sleep Apnea in Adults: A Systematic Review and Meta-Analysis SLEEP 2010;33(10): 1396-1407.

[6]. Holty JE, Guilleminault C. Maxillomandibular advancement for the treatment of obstructive sleep apnea: a systematic review and meta-analysis. Sleep Med Rev. 2010;14(5):27-97.

[7]. Kushida CA,Morgenthaler et al.practice parameters for the treatment of snoring and obstructive sleep apnea with oral appliances:An update. 2005.Sleep.2006;29:240

[8]. Waite PD, Wooten V et al. Maxillomandibular advancement surgery in 23 patients with obstructive sleep apnea.J Oral Maxillofac Surg.1989;47:1256-1261

[9]. Caples SM,Prinsell JR et al.Surgical modifications of the upper airway for obstructive sleep apnea in adults. A systemic review and meta-analysis. Sleep 2010;33:1396

[10]. Prinsell JR. Primary and secondary telegnathic maxillomandibular advancement with or without adjunctive procedures,for obstructive sleep apnea in adults: A literature review and treatment recommendations.J Oral Maxillofac Surg.2012;70:1659-1677

[11]. Greenburg DL, Lettieri CJ, Eliasson AH. Effects of surgical weight loss on measures of obstructive sleep apnea: a meta-analysis. Am J Med. 2009;122(6): 55-42.

Corresponding Author: Dr. Mukund Gupta

[1]Reader, Department of Oral and Maxillofacial Surgery, KDCRC