Modified Cautery Assisted Palatal Stiffening Operation in the treatment of Habitual Snoring

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بسم الله الرحمن الرحيم

"و قل رب زدني علما"

صدق الله العظيم

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List of abbreviations

OSA:	Obstructive sleep apnea
SDB:	Sleep disordered breathing
OSAHS:	Obstructive sleep apnea/hypopnea syndrome
CPAP:	Continuous positive airway pressure
CAPSO:	Cautery Assisted Palatal Stiffening Operation
CN X:	10^{th} cranial nerve
CN V:	5^{th} cranial nerve
BMI:	Body mass index
MR:	Magnetic resonance
Pa:	Pascal
mPa:	Millipascal
SPL:	Sound pressure level
N:	Unit of loudness
Hz:	Hertz
UARS:	Upper airway resistance syndrome
OSAS:	Obstructive sleep apnea syndrome
ESS:	Epworth sleepiness scale
SSI:	Snoring Symptoms Inventory
PSG:	Polysomnography
CT:	Computerized tomography
MRI:	Magnetic resonance Imaging
ICSD-2:	International Classification of Sleep Disorders
MPAP:	Mean pulmonary arterial pressure
AHI:	Apnea-Hypopnea index
HRQoL:	Health related quality of life
FTT:	Failure to thrive
ADHD:	Attention deficit-hyperactivity disorder
ROM:	Recurrent otitis media
UPPP:	Uvulopalatopharyngoplasty
CVS:	Cerebrovascular stroke
CAD:	Coronary heart disease
DM:	Diabetes mellitus
COPD:	Chronic obstructive pulmonary disease
IL-6:	Interleukin 6
TNF- α:	Tumor necrosis factor
dB:	Decibel
U:	Units

OA:	Oral appliance
nCPAP:	Nasal continuous positive airway pressure
MAA:	Mandibular advancement appliances
H20:	Water
BiPAP:	Bi-level positive airway pressure
Cm:	Centimeter
ATE:	Adenotonsillectomy
IRFT:	Interstitial radiofrequency therapy
SP:	Soft palate
RF:	Radiofrequency
mL:	Milliliter
°C:	Degree Celsius
J:	Joules
FDA:	Food and Drug Administration
PET:	Polyethylene terephthalate
UPF:	Uvulopalatal flap
LAUP:	Laser – assisted uvulopalatoplasty
VPI:	Velopharyngeal incompetence
LP:	Laser palatoplasty
W:	Watt
mm:	Millimeter
MPH:	Mandibular plane to hyoid distance
LA-UPPP:	Laser-assisted uvulopalatopharyngoplasty
RAUP:	Radiofrequency-assisted uvulopalatoplasty
kHz:	Kilo hertz
MHz:	Mega hertz
CAPSO:	Cautery-assisted palatal stiffening operation
RDI:	Respiratory disturbance index
EDS:	Excessive daytime somnolence
ZPPP:	Zetapalatopharyngoplasty
CO2:	Carbon dioxide
U.S:	United states
HS:	Hyoid suspension
MMA:	Maxillomandibular advancement
MLS:	Multilevel surgery
VAS:	Visual analogue scale
UPPD:	Uvulopalatal punctate diathermy
MRAUP:	Modified radiofrequency assisted uvulopalatoplasty
RFA:	Radiofrequency ablation
NPL:	Nasopharyngeal laryngoscopy

IS:	Injection snoreplasty
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Abstract

Background: Snoring is a relatively common complaint that is more common in males. Snoring is a unique clinical situation, in which the snorer is considered to be a patient and given treatment. Many options are available, surgical and non-surgical. Surgical treatment includes procedures done using cold instruments, radiofrequency, laser and cautery (UPPP, LAUP, RAUP, CAPSO and their modifications).

Objective & Design: In this prospective study 50 patients underwent Modified Cautery Assisted Palatal Stiffening Operation "CAPSO" under general anaesthesia to evaluate it's effectiveness in the treatment of snoring.

Material: All patients were only snorers with BMI less than 33, tonsil size grades 1 and 2. Assessment was done using VAS for improvement of snoring, Muller's maneuver and Eliciting palatal flutter on voluntary mimicking of the snoring sound.

Results: Out of the 50 patients 9 patients had excellent results (18%), 2 of which reported complete abolishment of snoring (4%). 6 patients were considered a failure (12%). The remaining 35 patients reported satisfactory results (70%).

Conclusion: In conclusion, Modified CAPSO is a simple, low cost procedure that can be performed as a single session with excellent results and a low complication rate.

Keywords: Modified CAPSO, Habitual snoring, Palatal stiffening.

Introduction and Aim of work

When we talk about snoring as an expression of life, we must consider the physical components to be fundamental. Sleep is the prerequisite for snoring, this already heralds the word itself which is of Greek-Latin origin: *stertere* (*snore*) may be related to the Greek word for *sleep*. It was stated about the inhabitants of Tarsus in Asia Minor, "They furnish the most distinct evidence of sleep, they snore". However, not all sleepers snore: "Snoring only befalls some of the sleeping". KARNEADES said, "you may even snore if you desire, not only rest." Snoring, however, does not exclusively occur during sleep. This sound is sometimes only shammed as a proof of sleep. ***(Pirsig, 2002).***

Snoring is not a new phenomenon. It has been recognized as a social problem for thousands of years, and is regularly referred to in classical literature. In these early references, there is often little distinction between the words for snoring or for sleep, which may well have the same origin in ancient Greek. Some of the predisposing factors to snoring were also frequently noted in ancient literature, but probably none more succinctly than in Virgil's Aeneid where three: obesity, alcohol and position are mentioned in a single line 'Who, gorged, and drunk with wine, supinely snore' ***(Counter and Wilson, 2004).***

Snoring is defined as the sounds made by vibrations in the soft palate and their adjacent tissues (such as the posterior faucial pillars) during sleep. Researchers have shown that it is the most important symptom connected with the obstructive sleep apnea (OSA) syndrome, as well as the cause of much disruption to bed partners and to the snorer ***(Verin et al., 2002).***

A useful working definition of snoring is the production of sound by *vibration* of the upper aerodigestive tract during sleep. The diagnosis of simple snoring, however, is one of exclusion. It requires that the presence of any other nocturnal respiratory pathology be excluded. It is therefore important for any physician treating snoring to understand the

pathophysiology behind sleep disordered breathing (SDB) ***(Counter and Wilson, 2004).***

Current research also shows that snoring might indicate the first stage of the OSA syndrome (Heavy snoring can result in sleep-related upper airway narrowing, which leads to respiratory flow limitation and increased respiratory effort. Strong inspiratory suction may, secondarily, cause a total upper airway collapse ***(Liu et al., 2007).***

Snoring is part of the spectrum of SDB, from obstructive sleep apnea/hypopnea syndrome (OSAHS) at one end to simple snoring at the other. The entire spectrum is characterized by changes in the physical conformation, structural properties and neuromuscular function of the pharynx. The spectrum has also been characterized in respect of the pressure required to collapse the upper airway. Thus, despite qualitative differences in pathology, the pathophysiological difference between simple snoring and OSAHS may be merely quantitative ***(Counter and Wilson, 2004).***

A mathematical model of snoring has been created in terms of airflow through an elastic tube. If the geometry, elasticity, resistance and flow are adjusted correctly then the tube can be made to open and close repetitively. This leads to production of sound that is acoustically very similar to snoring. If the parameters are altered further complete collapse of the tube can be created, simulating apnoea. Unfortunately this technique does not reliably locate exact level of sound production within the pharynx, as the airway instability may occur at any level. Similarly, clinical observations confirm vibration anywhere from the soft palate to the epiglottis. This mathematical model does, however, suggest the mechanism by which variations in muscle tone, airway dimensions and route of breathing (nasal or oral) may cause snoring ***(Gavriely and Jensen, 1993).***

If untreated, heavy snoring may be complicated by excessive daytime sleepiness. Hence, snoring has received much clinical attention in recent years. These studies are mainly devoted to the effects of snoring on health and to the treatment effects ***(Ayappa and Rapoport, 2003).***