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Role of Nasal Turbinectomy in Adult Obesity

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Abstract: *Objective:To analyse the results of management of nasal obstruction (nasal turbinectomy(NT) and nasal medical treatment) on obesity* ***Design:*** *Prospective study of chronic nasal obstruction (CNO) in 40 obese patients between December 2021 and May 2022, 28 Females and 12 Males ,their age range was 21-54 years(Y) , with a mean age of 31.2 Y and their range of duration of nasal obstruction (NO) was 1-20 Y, with a mean duration of NO was 6.2 Y and their range of duration of Obesity (Ob) was 2-22 Y, with a mean duration of Ob 7.1 Y with their range of Mass index (BMI) was 25-≥40 kg/m^2 with a mean BMI was 33.15 kg/m^2.The operation of NT (total or partial removal of middle and/or inferior turbinate) has been performed in 20 patients(P) by the same author & a control group of medical treatment(in the form of nasal decongestant drops and nasal steroid spray) of NO has been performed in other 20 P. All the P underwent pre-operative ,pre-medical , post-operative and post-medical assessment with a questionnaire (Q) of NO, using the visual analogue scale (VAS) and a measuring of BMI.* ***Results:*** *NT showed complete cure of NO in 20 P by Q (subjective analysis) and a mean of BMI was decreased(objective analysis). A control group of medical treatment of NO showed temporary improvement & unchanged or worsened NO by Q with a little changed or unchanged BMI mean. The difference was statistically significant (P <0.01).*
Conclusion: *NT may play an important role in management of Ob in patients with CNO.*

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I. Introduction

Each patient completed a Q to elicit information on medications, medical history and subjective assessment of pre-operative & post-operative chronic nasal obstruction (CNO) using the visual analogue scale (VAS). The scoring is 0 (no symptom or completely clear) to 10 (severe or complete obstruction). 1 and a measuring of the body mass index (BMI); body weight in kilograms, divided by height in meters squared which ranges from underweight or wasting (<18.5 kg/m^2) to severe or morbid obesity (≥40 kg/m^2) 2 Obesity is a complex, multifactorial, and largely preventable disease 3, affecting, along with overweight, over a third of the world's population today 4,5. An estimated 38% of the world's adult population will be overweight and another20% will be obese by 2030 6. Obesity is an excess body weight for height associated with excess adiposity, or body fatness and not just in terms of body size 7. Obesity greatly increases risk of chronic diseases as disability, depression, type 2 diabetes, cardiovascular disease, certain cancers and mortality. Childhood obesity results in the same conditions with premature onset or in adulthood 8. waist circumference, a measure of abdominal adiposity, has become an increasingly important and discriminating measure of overweight/obesity 9. Abdominal adiposity is a visceral, metabolically active fat surrounding the organs, and is associated with metabolic dysregulation, predisposing individuals to cardiovascular disease and related conditions 10. a waist circumference resulting in increased cardiovascular risk is defined as ≥94 cm in men, and ≥80 cm in women . Today, overweight (BMI 25–<30 kg/m^2) or obese (BMI ≥30 kg/m^2) 11 Excess weight and type 2 diabetes are so tightly linked and risk of future diabetes in *asymptomatic* people ≥45 years old if they are overweight/obese, and regardless of age if they are severely obese 12 Severely obese patients had upwards of 30% increased risk of mortality from their trauma than non-obese patients, and the risk of wound complications, Alzheimer's disease, vascular dementia, or any type of dementia 13. The aim of this report was to review the cases of nasal turbinectomy performed on chronic nasal obstruction with obesity and compare the results with those of nasal medical treatment of chronic nasal obstruction with obesity.

II. Materials and Methods

Patients selected were having CNO/Ob not previously treated surgically and these patients included long history and persistent (more than one year) of Ob and CNO. All the patients underwent pre-operative nasal endoscope and coronal computed tomography of the nose and paranasal sinuses on the basis of Kennedy's CT staging.1 All the patients has bilateral CNO with anatomic obstruction only (as HMT, HIT, DS, DSHMT,

DSHIT, DSHMTHIT or CB). No septic focus , polyp or mass was found pre-operatively or pre-medically in either the pharynx or the nose. The operation of NT (total or partial removal of middle and/or inferior turbinate) was performed by a microdebridor under local anaethesia (nasociliary, infraorbital blocks with topical anaesthesia of the pterygo- palatine nerves. The blocks were bilateral. Topical anaesthesia on each side, just posterior to the middle turbinate by a small piece of gauze soaked in 2 % lignocaine at the end of the nasal passage for at least 10 min . To block the infraorbital nerve, an oral or nasal approach, by 3 ml 2% lignocaine, a 3-cm, 25-gauge needle was injected in the vicinity of the foramen without entering the canal .To block the nasociliary nerve or its branches, needle as above was inserted 1 cm above the inner canthus and directed posterolaterally, keeping contact with bone,14,15,16) in 20 Ob patients(P) 14 Females and 6 Males ,their age range was 21-54 years(Y) , with a mean age of 33.75Y and their range of duration of NO was 1-20 Y, with a mean duration of NO was 6.15 Y and according to the VAS, CNO was 8-10 , with a mean 8.5. and their range of duration of Ob was 2-22 Y, with a mean duration of Ob 10.65 Y with their range of Mass index (BMI) was 25-≥40 kg/m^2 with a mean BMI was 31.4 kg/m^2 . All the P underwent pre-operative & post-operative assessment with a questionnaire (Q) of NO, using VAS and a measuring of BMI. The operations were performed successively by the same author in the period between December 2021 and May 2022. The details of the operations are shown in table 1. The control group of medical treatment(in the form of nasal decongestant drops and nasal steroid spray) of NO has been performed in other 20 Ob Patients by the same author in the same period between December 2021 and May 2022. There were 14 Females and 6 Males , their age range was 21-54 years(Y) , with a mean age of 34.2Y and their range of duration of NO was 1-20 Y, with a mean duration of NO was 5.55Y and according to the VAS, CNO was 8-10 , with a mean 8.5. and their range of duration of Ob was 2-22 Y, with a mean duration of Ob 8.95 Y with their range of Mass index (BMI) was 25-≥40 kg/m^2 with a mean BMI was 30.8 kg/m^2 .Follow- up of all patients was performed by endoscope , Q (by asking if NO had cured, improved, worsened or remained unchanged and scoring according to VAS) and measuring of weight and hight (BMI) by a body and a metre Scales at two-week intervals at the first month and three month post-operative & post-medical. The results were analysed statistically by means of the chi-squared test.

III. Results

The details of the patients in NT and post-operative results are shown in table 1. NT showed complete cure (VAS score is 0)of NO in 20 P by Q (subjective analysis) with range BMI was 22-27 kg/m^2 with a mean BMI was 24.4 kg/m^2 (decreased mean BMI).A control group of medical treatment of NO showed temporary improvement & unchanged or worsened NO by Q with range BMI was 24-38 kg/m^2 with a mean BMI was 30.25 kg/m^2 (little changed or unchanged mean BMI) . The details of the patients in medical treatment of NO and post-medical results are shown in table 2. The difference in terms of complete cure of NO & decreased mean BMI was statistically significant ($P < 0.01$).

Data concerning nasal turbinectomy in CNO/Ob patients Table 1

Patient no	Age(Y)	Sex	Duration (Y) of NO	BMI Of Ob	endoscopic examination	CT findings	NT MT total	NT MT partial	NT IT partial	Last follow up Result Post-operative
1	21	f	1	25	HM	CB	+	-	-	CC & -BMI
2	25	f	2	30	HMHI	HMHI	-	+	+	CC &-BMI
3	54	f	20	35	HM	CB	-	+	-	CC &-BMI
4	52	f	15	28	DSHI	HI	-	+	+	CC &-BMI
5	45	f	10	32	DS	-	+	-	-	CC &-BMI
6	40	f	7	34	DSHI	DSHI	+	-	+	CC &-BMI
7	50	f	5	30	HI	HI	-	+	+	CC &-BMI
8	48	f	12	34	HI	HI	+	-	+	CC &-BMI
9	22	f	2	27	DS	DS	+	-	+	CC &-BMI
10	23	f	3	28	HM	CB	+	-	-	CC &-BMI
11	25	f	5	30	HI	HI	-	-	+	CC &-BMI
12	47	f	9	38	HMHI	HMHI	+	-	-	CC &-BMI
13	36	f	4	32	DSHI	DSHI	-	+	+	CC &-BMI
14	21	f	2	25	HM	CB	+	-	-	CC &-BMI
15	24	m	3	35	HMHI	HMHI	+	-	+	CC &-BMI
16	30	m	5	32	DS	-	+	-	+	CC &-BMI
17	40	m	9	36	HMDS	DS	+	-	+	CC &-BMI
18	29	m	4	40	HI	HI	-	+	+	CC &-BMI
19	21	m	3	32	HI	HI	+	-	+	CC &-BMI
20	22	m	2	25	HM	CB	+	-	-	CC &-BMI

CC complete cure , BMI body mass index, -BMI decrease body mass index, f female, m male,HM hypertrophic middle turbinate, HI hypertrophic inferior turbinate, DS deviated septum, CB concha bullosa of middle turbinate.

Data concerning nasal medical treatment in CNO/Ob patients Table 2

Patient no	Age(Y)	Sex	Duration (Y) of NO	BMI Of Ob	endoscopic examination	CT findings	Nasal decongestant drops(flagrivin) alone	Nasal steroid spray(flixonase) alone	Both nasal spray and drops	Last follow up Result Post-medical
1	23	f	3	30	HM	CB	+	-	-	Ti NO& unBMI
2	27	f	3	30	HMHI	HMHI	-	-	+	unNO &unBMI
3	44	f	10	30	HM	CB	-	-	+	unNO &unBMI
4	54	f	12	25	DSHI	HI	+	-	-	unNO &unBMI
5	35	f	10	32	DS	-	-	-	+	TiNO&unBMI
6	43	f	5	35	DSHI	DSHI	-	+	-	unNO &*BMI
7	51	f	8	35	HI	HI	+	-	-	TiNO&unBMI
8	28	f	8	34	HI	HI	-	+	-	TiNO &*BMI
9	29	f	4	28	DS	DS	-	-	+	TiNO &unBMI
10	33	f	4	28	HM	CB	-	+	-	unNO &unBMI
11	45	f	6	40	HI	HI	-	-	+	unNO &unBMI
12	32	f	5	28	HMHI	HMHI	-	-	+	TiNO &*BMI
13	23	f	2	31	DSHI	DSHI	+	-	-	unNO&unBMI
14	31	f	6	35	HM	CB	-	-	+	unNO&unBMI
15	44	m	9	25	HMHI	HMHI	-	+	-	TiNO&unBMI
16	32	m	3	30	DS	-	+	-	-	unNO &unBMI
17	30	m	2	33	HMDS	DS	-	-	+	unNO &unBMI
18	25	m	2	30	HI	HI	+	-	-	TiNO &*BMI
19	31	m	5	32	HI	HI	+	-	-	unNO&unBMI
20	24	m	4	25	HM	CB	-	-	+	unNO &unBMI

CT computerized tomography, nasal decongestant drops xylometazoline hydrochloride nasal solution USP 0.1% W/V 100ml (flagrivin 0.1%) 2 drops in each side of nose 2 times perday for 7 days,nasal steroid spray(flixonase 50 mcg per md fluticasone propionate) 2 spray in each side of nose 2 times perday for 21 days, TiNO temporary improved nasal obstruction, unBMI unchanged body mass index, unNO unchanged nasal obstruction,*BMI little changed body mass index.

IV. Discussion

Caloric restriction remains today a primary focus of most popular and clinical weight-management and weight-loss approaches. Overweight/obesity in middle age shortens life expectancy by an estimated 4–7 years 17.

OSA (obstructive sleep apnoea) is characterized by recurrent obstruction of the pharyngeal airway during sleep, with resultant hypoxia and sleep fragmentation. The pathogenesis of OSA is due to the interaction between unfavorable anatomic upper airway (UA) susceptibility and sleep-related changes in UA function.18 Sleep is associated with a decreased metabolic rate, loss of the wakefulness drive to breathe 5, and a subsequent decrease in ventilatory motor output to respiratory muscles, including upper airway (UA) muscle., the loss of the wakefulness drive to breathe renders respiration during sleep critically dependent on the level of chemoreceptor and mechanoreceptor stimuli 19 .The amount of oxygen in the adipose tissue microenvironment may also impact AT(adipose tissue) metabolism and inflammation, and WAT(white adipose tissue) oxygenation may, therefore, be a key factor in the pathophysiology of AT dysfunction and related chronic diseases.20,21,22 One of the main functions of WAT is the preservation of energy in the form of triacylglycerol (TAG) in response to a chronic-positive energy balance.23 Ectopic fat accumulation when lipid uptake exceeds lipid oxidation.23 WAT pO_2 is the result of a delicate balance between O_2 supply and consumption, which both seem to be altered in obesity. Differences in angiogenesis, capillary density and vascular function, together determining adipose tissue blood flow (ATBF), and the cellular demands affecting O_2 consumption contribute to changes in WAT pO_2.20,23,24 Adipocytes must maintain and adjust their metabolic and physiological regulation in response to variation in oxygen levels.22, 25 The main regulators of oxygen sensing are the oxygen sensitive HIFs. HIFs are transcription factors, binding to the DNA and changing gene expression in response to alterations in oxygen levels.26 HIFs consist of two subunits, α and β, with the former being the oxygen sensitive molecule and HIF-1β being constitutively expressed by cells.25 The HIF family consists of three members based on the three α-subunits, HIF-1α, HIF-2α and HIF-3α, with the predominant members being HIF-1α and HIF-2α.26,27,28 HIF-1α has been described as the master regulator of oxygen homeostasis. HIF-1α is continuously synthesized and rapidly degraded in the presence of oxygen but is stabilized when oxygen levels are low, during sufficient oxygenation of the cells, HIF-1α is enzymatically degraded by prolyl-4-hydroxylases through the proteasome.27 During "hypoxic" conditions, which are tissue-dependent, the prolyl

hydroxylase domain enzymes are inactivated, and HIF-1α is not subject to rapid degradation. Instead, HIF-1α then forms a heterodimer with the β subunit, acting on DNA binding areas called hypoxia-responsive elements, thus regulating gene expression of many different genes.29,23,21,27,30 These genes encode proteins involved in a multiplicity of cellular processes, including glucose and lipid metabolism, inflammation, ECM metabolism and apoptosis.21 This explains that Chronic nasal obstruction may lead to hypoxia or OSA causing hypoxia which reduces the amount of oxygen in the adipose tissue and adipose tissue dysfunction and related chronic diseases.

V. Conclusion

1- Chronic nasal obstruction may lead to hypoxia or OSA causing hypoxia which reduces the amount of oxygen in the adipose tissue impacting adipose tissue metabolism which in turn leads to Obesity and related chronic diseases.

2- Nasal Turbinectomy(NT) is an effective method in cure of anatomical nasal obstruction as Deviated septum and nasal hypertrophic turbinates.

3-In the future, depending on the technology, the theory that there are receptors in the nasal turbinates (Middle ,inferior or both) that are related to the weight control center may be present.

VI. Summary

Prospective study was to analyse the results of nasal turbinectomy (NT) and nasal medical treatment of nasal obstruction (NO) on NO & obesity(Ob). 40 ob P with CNO underwent this study & divided into; 20 P were performed a NT (total or partial removal of middle and/or inferior turbinate) by a microdebridor under local anaethesia and a control group comprised 20 P who had a medical treatment(in the form of nasal decongestant drops and nasal steroid spray) of NO. All the P underwent pre-operative ,pre-medical , post-operative and post-medical assessment with Q of NO, using VAS and a measuring of BMI by a body and metre scales. The difference was statistically significant ($P < 0.01$). NT is an effective method in cure of anatomical nasal obstruction as Deviated septum and nasal hypertrophic turbinates & NT may play an important role in management of Ob in P with CNO.

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A covering letter

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Role of Dr.EL KABANI(an author for correspondence): Choice of the subject, Selection of patients,, All the operations, Assessment of patients pre-operative , post-operative and post-medical treatment ,follow up, Results, Conclusion and Writing the paper were performed by the same author (Dr.ELKABANI).

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