

**TABLES & GRAPHS****Table 1: Subject selection criteria**

<b>Demographic criteria</b>	
<ul style="list-style-type: none"> <li>Adults of age group 25 to 45 years;</li> <li>Gender distribution of 1:1 – in accordance to world population gender ratio (<i>World gender population ratio – U.N. Statistics Division, 2008</i>)<sup>[12]</sup>.</li> <li>BMI index range of 18.5 to 29.99 - considered as the normal to mild overweight range in accordance to W.H.O. standards (<i>Global data base on Body-Mass Index –W.H.O., 2004</i>)<sup>[13]</sup>.</li> </ul>	
<b>Clinical criteria</b>	
<u>Control group (Group A)</u>	<u>Sample groups (Groups B &amp; C)</u>
<p>1) Adults with mesomorphic body type Very low daytime sleeping tendency - Epworth sleepiness scale <sup>[14]</sup> score of 2 to 10 Subjects without the following symptoms: Anxiety, stress, forgetfulness, irritability, frequent awakenings during nights, tiredness after awakening in the mornings, fatigue, lack of concentration, disorientation, snoring or forceful/difficult breathing during sleep. Because these symptoms are associated with disturbances in sleep pattern. Subjects not under medication for: Respiratory disorders, psychological disorders, neurological disorders and cardio-vascular disorders. Not under intake of corticosteroids, broncho-dilators, sedatives and anti-hypertensive drugs, as these drugs may interfere with the regular sleep pattern.</p>	<p>1) Adults with mesomorphic body type History of daytime sleeping tendency – Epworth sleepiness scale &gt; 10, Subjects with five of the below ten symptoms: Anxiety, stress, forgetfulness, irritability, frequent awakenings during nights, tiredness after awakening in the mornings, fatigue, lack of concentration, disorientation, snoring or forceful/difficult breathing during sleep. Subjects not under current medication for: Respiratory disorders, psychological disorders, neurological disorders and cardio-vascular disorders. Not under intake of corticosteroids, sedatives, broncho-dilators, anti-hypertensive drugs.</p>
<b>Geographic criteria</b>	
<u>Control group – (Group A)</u>	<u>Sample groups (Groups B &amp; C)</u>
<p>Patients reporting at Out-patient section of Department of Prosthodontics-SRM Dental College-SRM University-Ramapuram-Chennai-India, with dental related problems but no sleep disturbance related complaints. Completely edentulous subjects were not included as it necessitates incorporation of additional retention aids in appliances.</p>	<p>Patients reporting at the Out-patient section of Department of Prosthodontics-SRM Dental College-SRM University-Ramapuram-Chennai-India, with sleep disturbances. Completely edentulous subjects were not included.</p>
<b>Temporal criteria</b>	
Subjects selected from September 2010 to November 2012, as they report at the department.	

**Table 2: Phase I - UA patency (surface area) values for control and sample groups (in mm<sup>2</sup>)**

Sample no.	Group A (Healthy)	Group B (Mild OSA)	Sample no.	Group A (Healthy)	Group B (Mild OSA)
1	467	312	21	475	267
2	425	276	22	412	345
3	475	246	23	343	312
4	402	301	24	443	286
5	413	285	25	410	298
6	388	297	26	376	245
7	435	345	27	387	312
8	416	267	28	402	334
9	379	302	29	432	286
10	465	293	30	454	278
11	412	332	31	387	254
12	403	245	32	411	291
13	381	314	33	395	306
14	454	274	34	419	287
15	471	304	35	454	256
16	352	268	36	397	263
17	411	315	37	485	279
18	432	369	38	416	318
19	398	257	39	429	321
20	476	405	40	384	281

**Table 3: Phase I - Mean values of 3-dimensional UA measurements**

<b>Group</b>	<b>Airway volume (mm<sup>3</sup>)</b>	<b>Retropalatal measurements – (at the narrowest point)</b>	<b>Retroglossal measurements – (at the narrowest point)</b>
<b>Group A Control Group (Healthy volunteers – 40 subjects)</b>	9885.8	A-P width : 21.3 mm Lateral width : 32.72 mm Area : 221.42 mm <sup>2</sup>	A-P width : 28.17 mm Lateral width : 49.01 mm Area : 826.54 mm <sup>2</sup>
<b>Group B – Sample Group (Mild OSA - 40 subjects)</b>	9054.7	A-P width : 10.71 mm Lateral width : 14.16 mm Area : 69.65 mm <sup>2</sup>	A-P width : 16.79 mm Lateral width : 33.6 mm Area : 382.75 mm <sup>2</sup>

**Table 4: Phase III - UA patency (surface area) values for control and sample groups (in mm<sup>2</sup>)**

Sample no.	Group A values	Group B without MRS	Group B with MRS	Group C without NPD	Group C with NPD	Statistical data
1	449	292	384	245	416	Group B – comparison of values before and after MRS placement Mean difference : -87.55 Degree of freedom : 19 t-value : -50.749 p-value : <0.0001
2	431	303	387	288	418	
3	427	297	378	302	394	
4	417	295	381	296	423	
5	443	288	374	289	404	
6	407	276	368	295	409	
7	412	273	371	291	411	
8	403	281	365	301	399	
9	429	279	381	288	428	
10	410	284	363	294	406	
11	446	294	382	268	401	Group C – comparison of values before and after NPD placement Mean difference : -125.85 Degree of freedom : 19 t-value : -32.323 p-value : <0.0001
12	437	302	379	259	391	
13	452	292	372	272	397	
14	439	298	376	280	406	
15	422	296	373	275	411	
16	417	282	379	287	404	
17	409	279	375	281	418	
18	398	284	381	254	405	
19	414	282	369	275	398	
20	417	286	376	271	389	
Mean	423.9	288.1	375.7	280.5	406.4	

**Table 5: Phase III - Mean values of 3-dimensional UA measurements**

<b>Group</b>	<b>Airway volume (mm<sup>3</sup>)</b>	<b>Retropalatal measurements – (at the narrowest point)</b>	<b>Retroglossal measurements – (at the narrowest point)</b>
<b>Group A Control Group (Healthy volunteers – 20 subjects)</b>	9929.2	A-P width : 24.72 mm Lateral width : 36.46 mm Area : 216.56 mm <sup>2</sup>	A-P width : 28.17 mm Lateral width : 49.01 mm Area : 826.54 mm <sup>2</sup>
<b>Group B Subjects without Mandibular repositioning splint (MRS) (Pre-op – 20 subjects)</b>	9025.8	A-P width : 9.76 mm Lateral width : 10.85 mm Area : 56.47 mm <sup>2</sup>	A-P width : 14.38 mm Lateral width : 21.43 mm Area : 156.83 mm <sup>2</sup>
<b>Group B Subjects with MRS (Post-op – 20 subjects)</b>	9387.2	A-P width : 18.47 mm Lateral width : 16.40 mm Area : 158.54 mm <sup>2</sup>	A-P width : 22.14 mm Lateral width : 34.12 mm Area : 561.92 mm <sup>2</sup>
<b>Group C Subjects without Nasopharyngeal device (NPD) (Pre-op – 20 subjects)</b>	9006.2	A-P width : 8.92 mm Lateral width : 11.65 mm Area : 58.43 mm <sup>2</sup>	A-P width : 15.01 mm Lateral width : 21.89 mm Area : 159.27 mm <sup>2</sup>
<b>Group C Subjects with NPD (Post-op – 20 subjects)</b>	9896.7	A-P width : 22.95 mm Lateral width : 33.43 mm Area : 209.93 mm <sup>2</sup>	A-P width : 26.08 mm Lateral width : 45.65 mm Area : 809.19 mm <sup>2</sup>

**Table 6: Phase III - Analysis of UA dimensions within & between control (group A) to sample (groups B & C) - ANOVA test**

Category	Degree freedom	Sum of Squares	Mean square	Standard Deviation	Standard Error	F value	P value	Lambda	Statistical power
<b>Airway volume</b>	2	10882898.680	5441449.340	Gr. A: 5.979 Gr. B: 5.288	Gr. A: 1.337 Gr. B: 1.182	139288.936	<.0001	278577.871	1.000
	57	2226.757	39.066	Gr. C: 7.314	Gr. C: 1.635				
<b>Retropalatal Antero-posterior width</b>	2	3147.969	1573.985	Gr. A: .181 Gr. B: .700	Gr. A: .040 Gr. B: .157	4851.547	<.0001	9703.093	1.000
	57	18.492	.324	Gr. C: .0.671	Gr. C: .15				
<b>Retropalatal Lateral width</b>	2	8710.735	4355.368	Gr. A: .118 Gr. B: .266	Gr. A: .026 Gr. B: .059	28038.198	<.0001	56076.396	1.000
	57	8.854	.155	Gr. C: .618	Gr. C: .138				
<b>Retropalatal Surface area</b>	2	340183.266	170091.633	Gr. A: 5.241 Gr. B: 2.924	Gr. A: 1.172 Gr. B: .654	11516.062	<.0001	23032.124	1.000
	57	841.887	14.770	Gr. C: 2.880	Gr. C: .644				
<b>Retroglossal Antero-posterior width</b>	2	2528.672	1264.336	Gr. A: 3.438 Gr. B: .338	Gr. A: .769 Gr. B: .076	314.301	<.0001	628.602	1.000
	57	229.294	4.023	Gr. C: .368	Gr. C: .082				
<b>Retroglossal Lateral width</b>	2	10263.799	5131.899	Gr. A: 2.843 Gr. B: .819	Gr. A: .636 Gr. B: .183	1728.892	<.0001	3457.784	1.000
	57	169.194	2.968	Gr. C: .393	Gr. C: .088				
<b>Retroglossal Surface area</b>	2	5988326.530	2994163.265	Gr. A: 6.250 Gr. B: 2.084	Gr. A: 1.398 Gr. B: .466	203641.558	<.0001	407283.116	1.000
	57	838.077	14.703	Gr. C: .839	Gr. C: .188				

**Table 7: Phase III - Analysis of UA dimensions within and between control to sample groups - *Post hoc test***

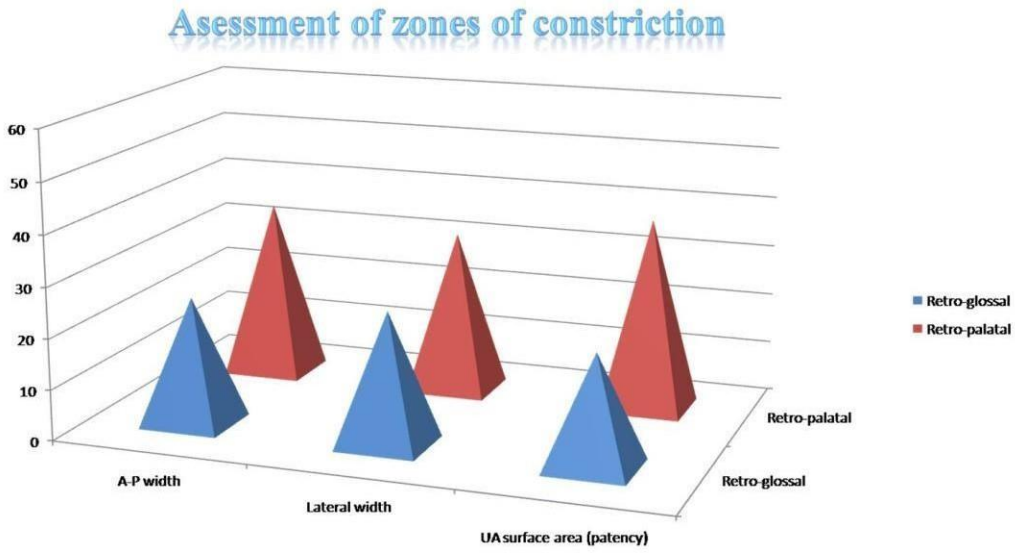
Category	Comparison	Significance Level	Mean Difference			Rejection			p-value (S-significant)		
			<i>Fisher</i>	<i>Schuffe</i>	<i>Benferroni</i>	<i>Fisher</i>	<i>Schuffe</i>	<i>Benferroni</i>	<i>Fisher</i>	<i>Schuffe</i>	<i>Benferroni</i>
Airway volume	Group A-B	5%	903.520	903.520	903.520	3.958	4.968	4.875	<.0001 S	<.0001 S	<.0001 S
	Group A-C	5%	903.375	903.375	903.375	3.958	4.968	4.875	<.0001 S	<.0001 S	<.0001 S
	Group B-C	5%	-.145	-.145	-.145	3.958	4.968	4.875	.9418	.9973	.9418
Retropalatal : Antero-posterior width	Group A-B	5%	15.147	15.147	15.147	.361	.453	.444	<.0001 S	<.0001 S	<.0001 S
	Group A-C	5%	15.575	15.575	15.575	.361	.453	.444	<.0001 S	<.0001 S	<.0001 S
	Group B-C	5%	.428	.428	.428	.361	.453	.444	.0209	.0677	.0209
Retropalatal : Lateral width	Group A-B	5%	25.635	25.635	25.635	.250	.313	.307	<.0001 S	<.0001 S	<.0001 S
	Group A-C	5%	25.484	25.484	25.484	.250	.313	.307	<.0001 S	<.0001 S	<.0001 S
	Group B-C	5%	-.151	-.151	-.151	.250	.313	.307	.2307	.4845	.2307
Retropalatal : Surface area	Group A-B	5%	159.885	159.885	159.885	2.434	3.055	2.998	<.0001 S	<.0001 S	<.0001 S
	Group A-C	5%	159.575	159.575	159.575	2.434	3.055	2.998	<.0001 S	<.0001 S	<.0001 S
	Group B-C	5%	-.310	-.310	-.310	2.434	3.055	2.998	.7996	.9680	.7996
Retroglossal : Antero-posterior width	Group A-B	5%	13.849	13.849	13.849	1.270	1.594	1.564	<.0001 S	<.0001 S	<.0001 S
	Group A-C	5%	13.693	13.693	13.693	1.270	1.594	1.564	<.0001 S	<.0001 S	<.0001 S
	Group B-C	5%	-.156	-.156	-.156	1.270	1.594	1.564	.8066	.9702	.8066
Retroglossal : Lateral width	Group A-B	5%	27.812	27.812	27.812	1.091	1.369	1.344	<.0001 S	<.0001 S	<.0001 S
	Group A-C	5%	27.677	27.677	27.677	1.091	1.369	1.344	<.0001 S	<.0001 S	<.0001 S
	Group B-C	5%	-.136	-.136	-.136	1.091	1.369	1.344	.8045	.9696	.8045
Retroglossal : Surface area	Group A-B	5%	670.230	670.230	670.230	2.428	3.048	2.991	<.0001 S	<.0001 S	<.0001 S
	Group A-C	5%	670.105	670.105	670.105	2.428	3.048	2.991	<.0001 S	<.0001 S	<.0001 S
	Group B-C	5%	-.125	-.125	-.125	2.428	3.048	2.991	.9183	.9947	.9183

**Table 8: Phase III - Analysis of treatment outcomes between MRS (Groups B) & NPD (Group C) - ANOVA test**

Category	Grouping	Standard Deviation	Standard Error	Degree freedom	Sum of Squares	Mean square	F value	P value	Lambda	Statistical power
Airway volume	Gr. B without MRS	5.288	1.182	1	1297875	1297874.8	22922.3	<.0001	22922.28	1.000
	Gr. B with MRS	11.305	2.528	38	2151.586	56.621	82745.4	<.0001	82745.45	1.000
	Gr. C without NPD	7.314	1.635	1	7595836	7595835.9	14122.3	<.0001	14122.34	1.000
	Gr. C with NPD	9.359	2.093	38	1296398	1296397.7				
Retropalatal Antero-posterior width	Gr. B without MRS	.700	.157	1	102.175	102.175	100.078	<.0001	100.078	1.000
	Gr. B with MRS	.350	.078	38	38.796	1.021	2442.57	<.0001	2442.571	1.000
	Gr. C without NPD	.671	.150	1	2676.025	2676.02	131.925	<.0001	131.925	1.000
	Gr. C with NPD	1.780	.398	38	144.534	144.534				
Retropalatal Lateral width	Gr. B without MRS	.266	.059	1	1825.961	1825.96	2804.75	<.0001	2804.755	1.000
	Gr. B with MRS	.402	.090	38	24.739	.651	5381.79	<.0001	5381.791	1.000
	Gr. C without NPD	.618	.138	1	4595.299	4595.29	2071.42	<.0001	2071.421	1.000
	Gr. C with NPD	1.548	.346	38	1768.704	1768.70				
Retropalatal Surface area	Gr. B without MRS	2.924	.654	1	14715.31	14715.3	867.370	<.0001	867.370	1.000
	Gr. B with MRS	2.804	.627	38	644.687	16.965	29663.3	<.0001	29663.30	1.000
	Gr. C without NPD	2.880	.644	1	330373.5	330373.5	1291.21	<.0001	1291.219	1.000
	Gr. C with NPD	5.613	1.255	38	14380.88	14380.884				
Retroglossal Antero-posterior width	Gr. B without MRS	.338	.076	1	132.304	132.304	361.527	<.0001	361.527	1.000
	Gr. B with MRS	.570	.127	38	13.906	.366	7821.47	<.0001	7821.470	1.000
	Gr. C without NPD	.368	.082	1	2247.412	2247.412	406.284	<.0001	406.284	1.000
	Gr. C with NPD	.856	.191	38	116.741	116.741				
Retroglossal Lateral width	Gr. B without MRS	.819	.183	1	1109.827	1109.827	1128.89	<.0001	1128.893	1.000
	Gr. B with MRS	.643	.144	38	37.358	.983	7596.72	<.0001	7596.729	1.000
	Gr. C without NPD	.393	.088	1	8098.904	8098.904	1003.48	<.0001	1003.484	1.000
	Gr. C with NPD	1.691	.378	38	1069.819	1069.819				
Retroglossal Surface area	Gr. B without MRS	2.084	.466	1	366148.8	366148.86	1896.33	<.0001	1896.333	1.000
	Gr. B with MRS	27.125	6.065	38	7337.138	193.083	27898.4	<.0001	27898.47	1.000
	Gr. C without NPD	.839	.188	1	5649100	5649100.9	1804.91	<.0001	1804.9	1.000
	Gr. C with NPD	7.095	1.586	38	365472.6	365472.64				
				7694.538	202.488					



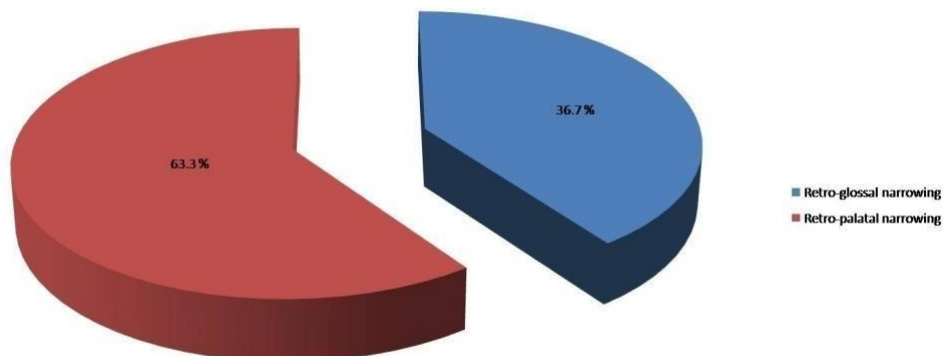
Graph I: Assessment of zones of constriction of UA in OSA subjects



	Retro-glossal	Retro-palatal
A-P width	15	25
Lateral width	17	23
UA surface area (patency)	13	27
Total subjects		40

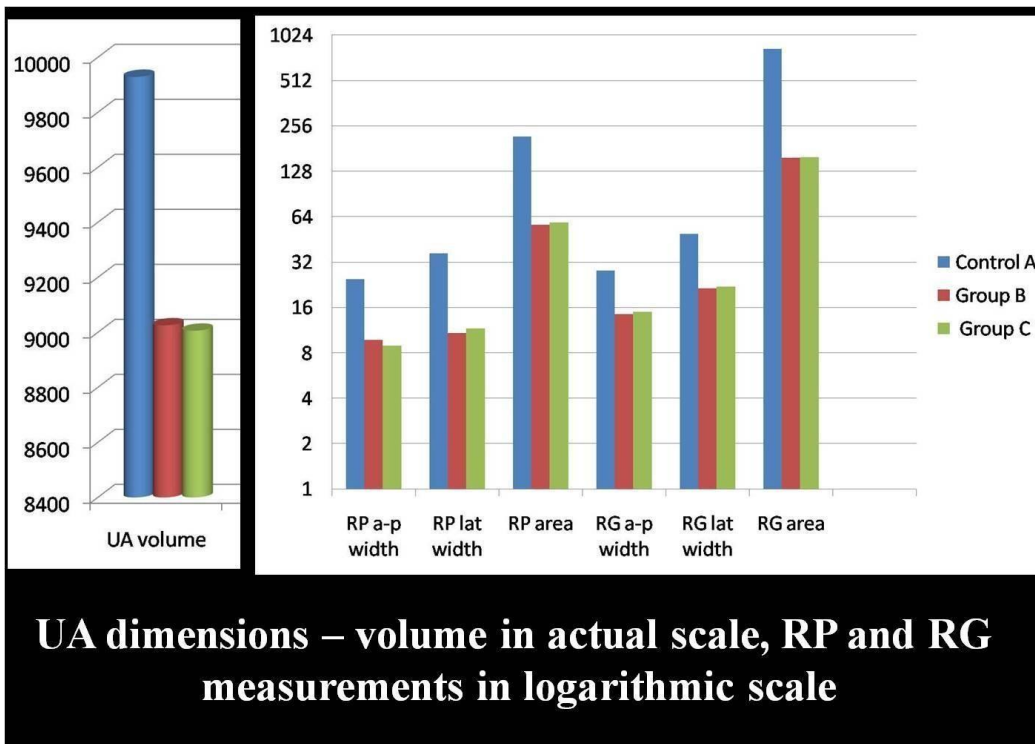
Graph II: Percentage of distribution of types of UA constriction in OSA subjects

**Percentage of distribution**



**Total – 40 subjects, Retro-palatal – 24, Retro-glossal – 16**

Graph III: Histogram revealing comparison of UA dimensions -Group A (control) to Groups B and C



Graph IV: Frequency polygon comparing treatment outcome - between MRS(Group B) and NPD (Group C)

