RESULTS

STATISTICAL RESULTS

For more accurate results, statistical analysis fro the change of animals weight was performed. There was insignificant change in the mean weight of animals (Control and study) of each group at time animals were sacrificed in comparison to its mean weight at the beginning of the study (time of RF ablation).

There was insignificant difference between the mean weight of control animals and the mean weight of study animals in each group. Also there was insignificant difference between the mean weight of control animals in the three groups. Moreover there was insignificant difference in the mean weight of study animals in the three groups. tables (8,9,10,12,13,14,16,17,18,20,21,22,23).

By Analysis Of Soft Palate Volumes:

As regard group A after one month the mean volume of the soft palate of control animals was 7.9 mm^3 and that of the study animals was 7.7 mm^3. So there was reduction in the mean volume of the soft palate by 2.5% however this reduction was statistically insignificant as P value more than 0.05. table (11).

For group B after two months of RF ablation. The mean volume of the soft palate of the control animals was 7.9 mm^3 and that of the study animals was 7.4 mm^3. So there was reduction in the mean volume by 6.3% this reduction was of significant value as P value equals 0.007 table (15) fig (13).

For group C after three months of RF ablation the mean volume of soft palate of the control animals was 7.8 mm^3 and that of the study animals was 6.2 mm^3. So there. was reduction in the mean volume by 20%. This reduction was of marked significance as p value less than 0.001 table (19) fig. (14).

By comparison of the mean volume of soft palate of the study animals of the three groups A, B and C with each other there was significant difference between:

mean volume of soft palate of study animals of group **B** versus that of group **A** (P value = 0.008).

mean volume of soft palate of study animals of group **C** versus that group **A** (P value <0.001).

mean volume of soft palate of study animals of group **C** versus that group **B** (P value <0.001).

This denoted that there was significant reduction in the mean of soft palate of study animals in relation to time after RF ablation table (26) fig (15).

Table (7): The master sheet showing weights and soft palate sizes of control and study animals in the three groups.

Wt.control	Wt. Study	Time	Size. Control	Size. Study	Group
1450	1470	A at beginning			Control A
1480	1475	A at beginning			Control A
1485	1480	A at beginning			Control A
1500	1500	A at beginning			Control A
1750	1570	A at beginning			Control A
1650	1655	A at beginning			Control A
1460	1550	A at beginning			Control A
1570	1575	A at beginning			Control A
1600	1545	A at beginning			Control A
1640	1645	A at beginning			Control A
1700	1705	A after 1 month	8.1	7.6	Group A
1680	1680	A after 1 month	7.9	8	Group A
1480	1490	A after 1 month	7.5	7.5	Group A
1500	1495	A after 1 month	8.2	7.7	Group A
1505	1500	A after 1 month	7.7	7.4	Group A
1515	1505	A after 1 month	7.7	7.3	Group A
1600	1590	A after 1 month	7.6	7.9	Group A
1505		A after 1 month	7.9		Group A
1500	1510	A after 1 month	8	7.7	Group A
1700	1700	A after 1 month	8.2	8.1	Group A
1705	1700	B at beginning			Control B
1650	1655	B at beginning			Control B
1600	1605	B at beginning			Control B
1590	1590	B at beginning			Control B
1500	1500	B at beginning			Control B
1620	1640	B at beginning			Control B
1720	1700	B at beginning			Control B
1750	1750	B at beginning			Control B
1640	1640	B at beginning			Control B
1605	1600	B at beginning			Control B

1680	1650	B after 2 months	7.5	7.2	Group B
1690	1700	B after 2 months	7.9	7.1	Group B
1500	1500	B after 2 months	8	7.1	Group B
1450	1460	B after 2 months	8.1	7.3	Group B
1480	1470	B after 2 months	8.3	7.4	Group B
1490	1495	B after 2 months	7.6	6.9	Group B
1600	1610	B after 2 months	7.6	6.8	Group B
1420		B after 2 months	7.7		Group B
1710	1700	B after 2 months	7.9	6.7	Group B
1550	1580	B after 2 months	8.2	6.8	Group B
1550	1560	C at beginning			Control C
1700	1750	C at beginning			Control C
1650	1670	C at beginning			Control C
1780	1750	C at beginning			Control C
1450	1510	C at beginning			Control C
1480	1400	C at beginning			Control C
1500	1510	C at beginning			Control C
1600	1700	C at beginning			Control C
1620	1580	C at beginning			Control C
1580	1650	C at beginning			Control C
1610	1630	C after 3 months	7.6	5.5	Group C
1640	1620	C after 3 months	7.8	5.7	Group C
1630	1675	C after 3 months	7.8	5.8	Group C
1680	1710	C after 3 months	8	7.1	Group C
1700	1700	C after 3 months	8	7	Group C
1710	1730	C after 3 months	8.1	6.5	Group C
1740	1600	C after 3 months	7.5	6.1	Group C
1500	1600	C after 3 months	7.7	5.9	Group C
1550	1450	C after 3 months	7.5	5.9	Group C
1580	1570	C after 3 months	8.2	6	Group C

GROUP A:

Table (8): Weight (gm) of control animals in group A:

	N	Minimum	Maximum	Mean	SD	Paired t	P value
Control A before RF	10	1450	1750	1558.5	100	0.5	>0.05
Control A after 1 month after RF	10	1470	1655	1546.5	67		

This table shows that there was insignificant change in the weight of control animals of group A after one month.

Table (9): Weight (gm) of study animals in group A:

	N	Minimum	Maximum	Mean	SD	Z	P value
Weight of study A before RF	10	1480	1700	1568.5	92	0.1	>0.05
Weight of study A 1 month after RF	9	1490	1705	1575	95		

This table shows that there was insignificant change in the weight of study animals of group A, one month after radio frequency ablation.

Table (10): Comparison between weights of control animals and study animals one month after radio frequency ablation:

	N	Minimum	Maximum	Mean	SD	Z	P value
Control A after 1 month	10	1470	1655	1546.5	67	0.7	>0.05
Weight of study A 1 month after RF	9	1490	1705	1575	95		

This table shows that there was insignificant difference between the weights of study animals after one month from radio frequency ablation versus control animals.

Table (11): Size of the soft palate (mm^3) in control and study animals one month after radio frequency ablation in group A:

	N	Mean ±SD	Minimum	Maximum	Z	P value
Size of soft palate of control animals of group A in mm3	10	7.9 ± 0.2	7.5	8.2	1.6	>0.05
Size of soft palate of study animals of group A (mm3) 1 month after RF ablation	9	7.7 ± 0.2	7.30	8		

This table shows that there was insignificant difference between the sizes of the soft palate of study animals in group A one month after radio frequency ablation versus that of control animals.

GROUP B:

Table (12): Weight (gm) of control animals in group B:

	N	Minimum	Maximum	Mean	SD	Paired t	P value
Weight of control B	10	1500	1750	1638	73.1	0	>0.05
Weight of control B after 2 months	10	1500	1750	1634.5	68.2		

This table shows that there was insignificant change in the weight of control animals of group B after two months.

Table (13): Weight (gm) of study animals in group B

	N	Mean	Minimum	Maximum	Z	P value
Weight of study B	10	1557 ± 106.5	1420	1710	-0.2	>0.05
Weight of study B 2 months after RF	9	1573.9 ± 96.4	1460	1700		

This table shows that there was insignificant change in the weight of study animals of group B two months after radio frequency ablation.

Table(14): Comparison between weights (gm) of control and study animals two months after radio frequency ablation

	N	Minimum	Maximum	Mean	SD	Z	P value
Weight of control B after 2 months	10	1500	1750	1634.5	68.2	1.7	>0.05
Weight of study B 2 months after RF	9	1460	1700	1585	102.8		

This table shows that there was insignificant difference between the weights of study animals two months after radio frequency ablation versus control animals.

Table (15): Size of the soft palate (mm^3) in group B:

	N	Minimum	Maximum	Mean	SD	Z	P value
Size of soft palate of control animals of group B	10	7.50	8.30	7.9	0.2		
Size of soft palate of study animals of group B 2 months after RF	9	6.7	7.40	7.04	0.2	-2.6	0.007

This table shows that there was statistically significant decrease in the size of the soft palate in the study animals of group B two months after radio frequency ablation versus that of control animals.

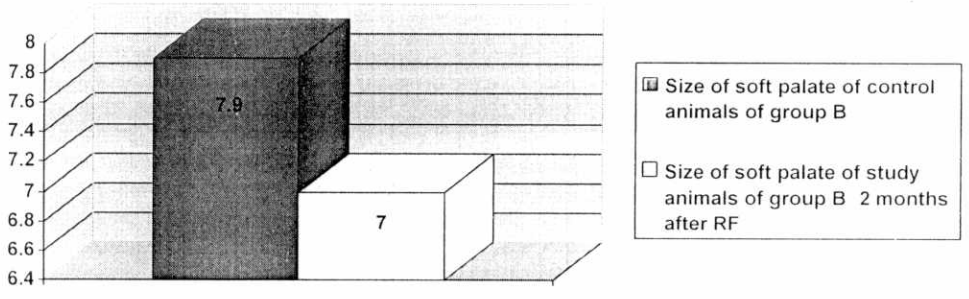

Figure (13): Mean size of soft palate in control and study animals of group B.

GROUP C

Table (16): Weight (gm) of control animals in group C:

	N	Mean ± SD	Minimum	Maximum	Paired t	P value
Weight of control C	10	1591 ± 102.4	1450	1780	0.9	0.3
Weight of control C after 3 months	10	1608 ± 115.5	1400	1750		

This table shows that there was insignificant change in the weight of control animals of group C after three months.

Table (17): Weight (gm) of study animals in group C:

	N	Mean ± SD	Minimum	Maximum	Paired t	P value
Weight of study C	10	1634 ± 76	1500	1740	0.25	0.8
Weight of study C 3 months after RF	10	1628.5 ± 82.5	1450	1730		

This table shows that there was insignificant change in the weight of study animals of group C three months after radio frequency ablation.

Table (18): Comparison between weights of control and study animals of group C.

Group	N	Mean ± SD	Unpaired t	P value
Control	10	1608 ± 115.5	0.4	0.6
Study group	10	1628.5 ± 82.5		

This table shows that there was insignificant difference between the weights of study animals three months after radio frequency ablation versus that of control animals.

Table (19): Size of the soft palate (mm^3) of control and study animals in group C:

	N	Mean ± SD	Minimum	Maximum	Unpaired t	P value
Size of soft palate of control animals of group C	10	7.8 ± 0.2	7.50	8.20	11.5	<0.001
Size of soft palate of study animals of group C 3 months after RF	10	6.2 ± 0.5	5.50	7.10		

This table shows that there was statistically significant decrease in the size of the soft palate of study animals in group C three months after radio frequency ablation versus that of control animals.

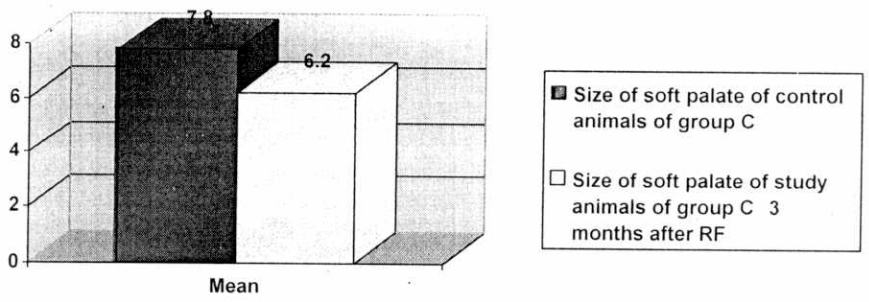

Figure (14): Mean Size of soft palate of control and study animals in group C

COMPARISON BETWEEN THE THREE GROUPS

Table (20): Weights (gm) of control animals in the three groups at the beginning of the study:

	N	Mean ± SD	Minimum	Maximum	ANOVA	
					$F_{2,27}$	P value
Group A	10	1558.5 ± 100	1450	1750	1.8	>0.05
Group B	10	1638 ± 73	1500	1750		
Group C	10	1591± 102	1450	1780		
Total	30	1595.8 ± 95.5	1450	1780		

This table shows that there was insignificant difference between the weights of control animals in the three groups at the beginning of the study (at time of radio frequency).

Table (21): Weights (gm) of control animals in the three groups at time of studying the soft palate.

	N	Mean ± SD	Minimum	Maximum	ANOVA	
					$F_{2,27}$	P value
Group A	10	1546.5 ± 67	1470	1655	2.7	>0.05
Group B	10	1634 ± 68.2	1500	1750		
Group C	10	1608 ± 115.5	1400	1750		
Total	30	1596.3 ± 91.5	1400	1750		

This table shows that there was insignificant difference between the weights of control animals in the three groups at time of studying the soft palate.

Table (22): Weights (gm) of study animals in the three groups at time of RF ablation

	N	Mean ± SD	Minimum	Maximum	ANOVA	
					$F_{2,27}$	P value
Group A	10	1568.5 ± 92	1480	1700		
Group B	10	1557 ± 106.5	1420	1710	2.02	0.1
Group C	10	1634 ± 76	1500	1740		
Total	30	1586.5 ± 95.5	1420	1740		

This table shows that there was insignificant difference between the weights of study animals in the three groups at time of radio frequency ablation.

Table (23): Weights (gm) of study animals in the three groups at time of studying the soft palate

	N	Mean	SD	Minimum	Maximum	ANOVA	
						F	P value
Group A	9	1575	95	1490	1705		
Group B	9	1573.9	96.4	1460	1700	1.1	>0.05
Group C	10	1628.5	82.5	1450	1730		

This table shows that there was insignificant difference between the weights of study animals in the three groups at time of studying soft palate.

Table (24): Comparison between sizes of the soft palate of control animals in the three groups.

		N	Mean ± SD	Minimum	Maximum	ANOVA	
						$F_{2,27}$	P value
Control groups	Group A	10	7.9 ± 0.2	7.5	8.2	0.1	>0.05
	Group B	10	7.9 ± 0.3	7.5	8.3		
	Group C	10	7.8± 0.2	7.5	8.2		
	Total	30	7.9± 0.3	7.5	8.3		

This table shows that there was insignificant difference between the sizes of the soft palate of control animals in the three groups.

Table (25): Comparison between sizes of soft palate of study animals in the three groups:

		N	Mean ± SD	Minimum	Maximum	ANOVA	
						F	P value
Study groups	Group A	9	7.7 ± 0.2	7.3	8	38.9	<0.001
	Group B	9	7 ± 0.2	6.7	7.4		
	Group C	10	6.2 ± 0.5	5.5	7.1		

This table shows that there was statistically significant decrease in the sizes of the soft palate of study animals in the three groups by time after radio frequency.

Table (26): Pair wise comparisons of the size of soft palate in study animals of the three groups (Scheffe test):

Study group	Versus study group	Mean Difference	P value
Group A	Group B	0.6	0.008
	Group C	1.5	< 0.001
Group B	Group C	0.9	<0.001

This table shows that size of soft palate decreased significantly in:

- Group B versus group A (p value 0.008).
- Group C versus group A (p value <0.001).
- Group C versus group B (p value < 0.001).

This results denoting that there was statistically significance decrease in size of soft palate by time.

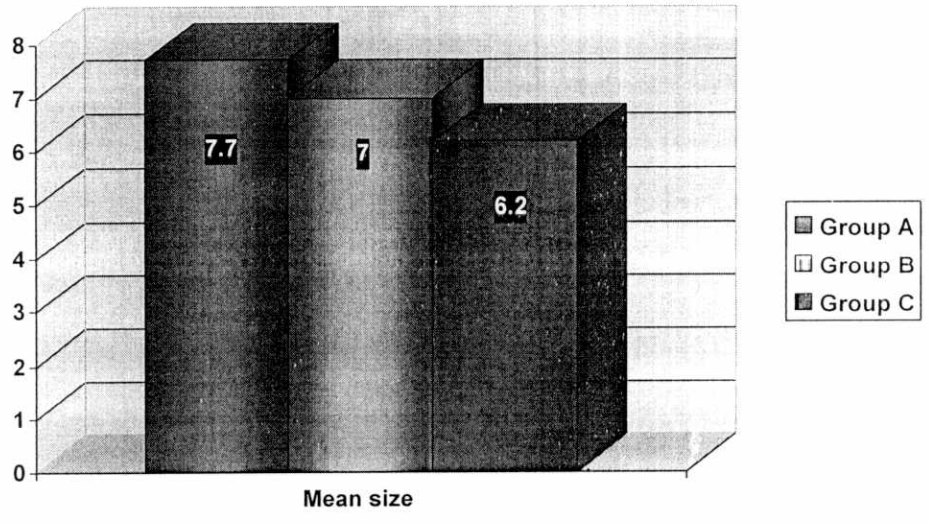

Figure (15): Mean size of soft palate of the study animals in the three groups

HISTOLOGICAL RESULTS

Histological Results Of Soft Palate Of Control Animals:-

The light microscopic study of the palate of the control groups showed covering non kertinized stratified squamous epithelium with the underlying mucous glands fig (16). The electron microscopic study shows clearly the non kertinized stratified squamous epithelium formed of many layers which are basal, stratum spinosum, granular and superficial fig (17). The stratum spinosum are formed of cells their nuclei increasingly elongated as the cells move toward the surface. these cells are joined with many desmosomes fig (18).

The mucous glands were seen in the specimen stained with alcian blue stain fig (19). With the electron microscope the glands were clearly seen with its flat cell lining and myoepithelial cells fig (20).

With masson trischrome stain, the muscle fibers are stained red and are separated with fine collagen fibers which are stained blue fig (21). With electron microscope the collagen fibers appeared in between the muscle fibers fig (22).The muscle fibers nuclei and abundant mitochondria are clearly seen by electron microscope fig (23).

Histological Results Of Soft Palate Of Study Animals:-

The following observations were seen in the study animals after radio frequency ablation except for two animals (one in group A and the other in group B) which have shown soft palate perforation and were excluded from the study :-

On examination of specimens of soft palate stained with H&E: the non keratinized stratified squamous epithelium was not affected in the three groups fig (24) and by electron microscopic examination there were no difference fig (25-26).

Also the mucous glands of the study animals appeared like that of the control animals when stained with Alcian blue stain fig (27) and also when studied by electron microscope fig (28).

There was increase of collagen fibers density which was mildly in group A, moderately in group B and markedly in group C. This was seen in specimens stained with mason trichrome stain fig (29).

In addition there was decrease in the size of the muscle fibers clearly seen in sections (longitudinal and transverse) of the muscles stained with mason trichrome fig (30,31).

These data were confirmed by electron microscopic study which showed mild, moderate and marked increase of the collagen fibers of group A, B and C respectively fig (32). There was also disruption of the muscle fibers fig (33). In addition electron microscopic study showed cleavage of the nuclei of the muscle fibers fig. (34).

Fig. (16) A photomicrograph of oral surface of soft palate of control group showing stratified squamous non keratinized epithelium (E), and underlying gland (G).

(H & E x 100)

Fig. (17) Electron micrograph of oral surface of soft palate of control group slowing stratified epithelium formed of many layers, Basal (B), spinoum (Sp), granular (G) and superficial (S).

(x 2800)

Fig. (18) Higher magnification of the previous figure showing the cells of the epidermis joined with many desmosomes (arrows)

(x 2800)

Fig. (19) Photomicrograph of oral surface of soft palate of control group showing the mucous glands (G).

(Alcian blue stain x400)

Fig. (20) Electron micrograph of mucous gland of control group showing flat cell (F) and myoepithelial cell (M). the lumen of the gland (L)

(x 2800)

Fig. (21) Photomicrograph of oral suface of soft palate of control group showing pharyngeopalatine muscle stained red and separated with fine collagen fibers staind blue.

(Masson trichrome x100)

Fig. (22) Electron micrograph of soft palate of control group showing callagen fibers.

(x8000)

Fig. (23) Electron micrograph of soft palate of control group showing muscle fibers; mucleus (N) and abundant mitochondria (M).

(x 8000)

Fig. (24) Photomicrograph of oral surface of soft palate of group (C). the stratified squamous nonkeratinized epithelium and the underlying glands were not affected.

(H & E x100)

Fig. (25) Electron micrograph of oral surface of soft palate of group (C). The stratified epithelium formed of many layers as that control animals .

(x 2800)

Fig. (26) Higher magnification of the previous figure showing the cells of the epidermis; note the desmosomes (arrows).

(x 2800)

Fig. (27) Photomicrograph of soft palate of group (C) showing the glands appeared as that of control group.

(Alcian blue x 400)

Fig. (28) Electron micrograph of soft palate of group (C) showing mucous glands appeared as that of control group.

(x 2800)

Fig. (29) Photomicrograph of soft palate palate of group (C) showing marked increase of the density of collagen fibers.

(Masson trichrome stain x400)

Fig. (30) Photomicrograph of soft palate of group (C) showing longitudinal section of muscle fibers; note that the muscles were decreased in size. The collagen fibers (arrows).

(masson trichrome x 400)

Fig. (31) Photomicrograph of soft palate of group (C) showing transverse section of muscle fibers; note that the muscles were decreased in size. The collagen fibers (arrows).

(Masson trichrome x400)

Fig. (32) Electron micrograph of soft palate of group (C) showing marked increase of collagen fibers.

(x 4600)

Fig. (33) Electron micrograph of soft palate of group (C) showing disruption of muscle fibers.

(x 8000)

Fig. (34) Electron micrograph of soft palate of group (C) showing there was cleavage of the nucleus of the muscle fibers (arrows).

(x 8000)