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## Effect of IFT, HMP V/S faradic current on abdominal fat in centrally obese subjects: A randomised clinical trial

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### Abstract

**Objectives:** Obesity is of growing concern in most of the cities worldwide. As there is dire dearth of literature pertaining to the comparison of the effects of IFT, HMP and Faradic stimulation in adjunct to set of exercise on abdominal fat, the present study was done to compare the effect of IFT, HMP and faradic stimulation on shedding of fat in abdominally obese people.

**Materials And Methods:** The intervention was implemented on two groups of 20 individuals each belonging to age group of 20-40 years with waist circumference > 120 cm in males and > 88 cm in females. IFT and Hot Moist Pack along with a set of exercises was given to group A and Faradic stimulation along with set of exercises was given to group B for a period of 3 months.

**Results:** The results revealed that there was a significant difference in the reduction of abdominal fat between both the groups with a p value difference of 0.0001 in context to abdominal girth and 0.0077 in context to TBW, thus indicating that Faradic Stimulation is better than IFT, HMP in reducing abdominal fat.

**Conclusion:** The present study concluded that faradic stimulation of abdominal muscles with a supervised exercise program was more significant in reducing abdominal obesity than IFT, HMP with a supervised exercise program

**Keywords:** Abdominal obesity, abdominal muscles, IFT, HMP, faradic stimulation

### Introduction

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health, leading to reduced life expectancy and / or increased health problems <sup>[1, 2]</sup>. Obesity is generally classified into Generalised obesity, Abdominal obesity, isolated generalised obesity, isolated abdominal obesity and combined obesity <sup>[3]</sup>.

There is a rapidly increasing trend of obesity in developing countries and the main reason is a change in lifestyle which is manifested by the following - dietary changes, physical inactivity, genetic factors and early life <sup>[4]</sup>.

India ranks as the 3<sup>rd</sup> most obese country in the world after USA and China. According to the National Family Health Survey 2007, out of India's total population, 12.1% males fall into the overweight or obese category and 16% females come into the overweight or obese category <sup>[5]</sup>.

Abdominal obesity, also known as beer belly, beer gut, pot belly, front butt, spare tyre or clinically as central obesity is when excessive abdominal fat around the stomach and abdomen has built up to the extent that it is likely to have a negative impact on health <sup>[1]</sup>

There are various causes of abdominal obesity but one of the immediate causes of abdominal obesity is net energy imbalance –the individual consumes more usable calories that it expends and excretes through the process of elimination.

Abdominal obesity leads to a variety of complications such as heart diseases, hypertension, insulin resistance, diabetes mellitus type II- lipodystrophies and polycystic ovarian syndrome <sup>[6]</sup>.

Several electrotherapy modalities e.g. Ultrasound, Shortwave Diathermy and Interferential therapy are widely used by the health and obesity clinics all around the world to counter obesity (Anderson & Wadden 1999; Klein 2000; Jakicic *et al.*, 2001) <sup>[7]</sup>.

Faradic current causes an isotonic contraction when applied. Such a contraction, when applied to a muscle, through a subsequent increase in blood flow and lymph evacuation, it increases the power and reduces the fat storage around the muscle, thus leading to faster and greater weight loss from the fat compartments of the body. In physiotherapy clinics, Faradic stimulation is effectively used to create a situation wherein there is an electrical generation of action potentials; giving rise to therapeutically significant physiological responses i.e. increased muscle strength, stimulated lymph and blood flow, analgesia, kinesthetic awareness and autonomic nervous system responses. Interferential current is a form of electrical stimulation in which two medium frequency currents are used to produce low frequency effect. [10] IFT has an ability to stimulate large number of muscle fibers for greater muscular work parasympathetic nerve fibers for causing increased blood flow in the region deeper tissues at the stimulated sites [7]. Hot moist packs are formed of silicate gel, like bentonite, covered in a fabric container. The gel absorbs a high content of water, which if it is hot supplies a optimal level of heat energy [8]. The various effects of heat therapy include vasodilatation causing an increase in the blood flow and removal of metabolites, improving the tone of the muscles and enhancing muscle performance [9].

### Methodology

The purpose of this randomized clinical trial was to compare the effectiveness of IFT, HMP v/s Faradic current along with a supervised exercise program on reduction of abdominal obesity in healthy young subjects in the age group from 20-40 years.

**Source of Data:** Data was collected from KLE's Prabhakar Kore Hospital, Students and Staff of KLE University, Belagavi for a period of 3 months.

**Method of Data Collection:** The method of a collection used for this study was a primary method.

- **Study Design:** Randomized Clinical Trial
- **Duration of study:** 3 months ( NOV 2015 – JAN 2016)
- **Sampling design:** Non – probability sampling.
- **Sampling technique:** Convenience sampling.

**Participants:** There were 3 male participants and 17 female participants in group A and 8 male participants and 12 female participants in group B with abdominal obesity.

### Materials Used

1. Measuring Tape.
2. Skinfold thickness callipers.
3. Weighing scale.

### Inclusion criteria

1. Normal males aged 20 – 40 years having waist circumference more than 102 cms and waist hip ratio greater than 0.9 units.
2. Normal Females aged 20 – 40 years having waist circumference more than 88 cms and waist hip ratio greater 0.8 units.

### Exclusion criteria

1. Hypertensives.
2. Patients with Metabolic syndrome.

3. Alcoholics and smokers.
4. Patients with any systemic illness.
5. Subjects with psychiatric illness.
6. Subjects with orthopaedic conditions.
7. Partum and post-partum females.

**Procedure:** An approval for the study was obtained from the Institutional Ethical Committee. Subjects were screened for their eligibility depending on inclusion and exclusion criteria to participate in this study.

**Group A:** A supervised intervention consisting of a hot moist pack for 15 minutes followed by interferential therapy on the abdominal surface and an exercise program was given 3 times a week for 20 minutes, Frequency - 4000 Hz, beat frequency swing mode, time of swing - 12sec, pattern of swing – 4 pole vector method, total treatment time - 20mins to normal individuals with central obesity aged 20-40 years for 4 weeks.

**Group B:** A supervised intervention consisting of a faradic current stimulation, for 20 minutes on the abdominal surface and an exercise program was executed 3 times a week to normal individuals with central obesity aged 20-40 years for 4 weeks.

### Results

**Statistical analysis:** Statistical analysis of the present study was done manually. For the purpose, all the data collected was entered into an excel sheet, tabulated and subjected to statistical analysis. Several statistical measures were used such as mean, standard deviation of mean and test of significance 't' test. Data from subjects demographic details i.e. Age, gender, BMI etc. were analyzed using t-test. Comparison between both the groups with respect to the outcome measures of abdominal girth, skin fold thickness and total body weight was done by independent t-test and pre and post intervention comparison between the three outcome measures in both the groups was done by paired t-test. Probability values less than 0.05 were considered significant and probability values less than 0.001 were considered highly significant.

### Abdominal girth

In the current study, group A, executed mean  $93.40 \pm 5.45$ , pre intervention and showed a reduction in mean abdominal girth to  $89.63 \pm 4.87$  after 4 weeks of intervention, and a mean difference of  $3.78 \pm 1.73$  is observed, also% difference of 4.04% and probability value of 0.0001 is observed which is highly significant.

Group B, showed mean of  $101.15 \pm 8.92$  of abdominal girth which reduced to  $93.28 \pm 7.97$  after 4 weeks of intervention and a mean difference of  $7.88 \pm 2.26$  is observed, a 7.79% difference was seen, and p value of 0.0001 was executed, implying the statistics highly significant.

Pre- intervention:-A comparative statistical analysis was done between both the groups which showed mean of  $93.40 \pm 5.45$  in group A and mean  $101.15 \pm 8.92$  in group B with t-values -3.3163 and p-value of 0.002 which is significant ( $p < 0.05$ ).

Post intervention:-A comparison between group A and B was done which showed mean of  $89.63 \pm 4.87$  in group A

and mean  $93.28 \pm 7.97$  in group B with t-value -1.7476 and p-value of 0.0886.

Difference:- The same comparison between pre and post intervention was done which showed mean  $3.78 \pm 1.73$  in group A and a mean  $7.88 \pm 2.26$  in group B with t-value -6.4472 and p-value of 0.0001 which is highly significant. ( $p < 0.0001$ - highly significant)

### Skinfold thickness

In the current study, group A executed  $36.00 \pm 4.98$  pre-intervention, and showed a reduction in mean skinfold thickness to  $34.10 \pm 4.32$  and a mean difference of  $1.90 \pm 0.79$  also a percentage difference of 5.28% is observed also probability value of 0.0001 which is highly significant.

Group B, showed mean of  $36.90 \pm 6.18$  of skinfold thickness measurement which reduced to  $34.55 \pm 5.89$  after 4 weeks of intervention and a mean difference of  $2.35 \pm 0.88$  is observed, a 6.37% percentage difference was seen, and p value of 0.0001 was executed implying the statistics highly significant.

Pre- intervention:-A comparison between group A and group B with respect to skinfold thickness measurement score at pre intervention showed mean of  $36.00 \pm 4.98$  in group A and  $36.90 \pm 6.18$  in group B with t-value -0.5069 and p-value of 0.6151.

Post intervention:-A comparison between group A and B with respect to skin fold thickness measurement score at post intervention showed mean of  $34.10 \pm 4.32$  in group A and mean  $34.55 \pm 5.89$  in group B with t-value -0.2756 and p-value of 0.7843.

Difference:- The same comparison between pre and post intervention was done which showed mean  $1.90 \pm 0.79$  in group A and a mean  $2.35 \pm 0.88$  in group B with t-value -1.7089 and p-value of 0.0956.

### Total body weight

In the current study, group A executed  $73.75 \pm 9.63$  pre-intervention, and showed a reduction in mean total body weight to  $72.68 \pm 9.53$  and a mean difference of  $1.08 \pm 0.98$  also a percentage difference of 1.46% is observed also probability value of 0.0001 which is highly significant.

Group B, showed mean of  $79.95 \pm 13.43$  of total body weight which reduced to  $77.98 \pm 14.03$  after 4 weeks of intervention and a mean difference of  $1.98 \pm 1.04$  is observed, a 2.47% percentage difference was seen, and p value of 0.0001 was executed implying the statistics highly significant.

Pre- intervention:-A comparison between group A and group B with respect to total body weight score at pre intervention showed mean of  $73.75 \pm 9.63$  in group A and  $77.98 \pm 14.08$  in group B with t-value -1.6775 and p-value of 0.101

Post intervention:-A comparison between group A and B with respect to total body weight score at post intervention showed mean of  $72.68 \pm 9.53$  in group A And mean  $77.98 \pm 14.08$  in group B with t-value -1.3943 and p-value of 0.1713.

Difference:- The same comparison between pre and post intervention was done which showed mean  $1.08 \pm 0.98$  in group A and a mean  $1.98 \pm 1.04$  in group B with t-value -2.8138 and p-value of 0.0077 which is significant.

A Comparison between both groups for all three outcome measures shows better reduction in abdominal obesity in

group B as compared to group A and thus we conclude that faradic stimulation of abdominal muscles with a supervised exercise program is more significant in reducing abdominal obesity than IFT, HMP and a supervised exercise program.

### Discussion

The current study was proposed to compare the effectiveness of IFT, HMP v/s Faradic stimulation with a supervised exercise program on abdominal fat in centrally obese young healthy individuals in the age group of 20-40 years.

The outcome measures used were abdominal circumference, skinfold thickness measurement and total body weight.

In the present study, abdominal circumference was taken as one of the outcome measures as the waist hip ratio and waist circumference were considered to be the superior predictors of anterior abdominal adipose mass and posterior subcutaneous abdominal adipose tissue according to Chan D and Watts G mass.

Abdominal circumference was measured before and after the study with the help of a measuring tape at the level of umbilicus, similarly this form of measurement of abdominal circumference was used to assess the change in abdominal girth in a study done by Aarti Welling<sup>[1]</sup>, Peeyoosha Nitsure<sup>2</sup> on 60 healthy individuals within the age group of 18 -40 years to see the effect of mat, Swiss ball and theraband exercises on abdominal girth.

While comparing the values within the group, a reduction in abdominal circumference was observed pre and post intervention. While comparing both the groups, it was noted that Group B (Faradic Stimulation) was significantly better than Group A (IFT).

The possible reason by the virtue of which Faradic Stimulation with a supervised exercise program helped in the reduction of abdominal fat is that Faradic Current breaks down fat molecules, converting them into FFA (free fatty acids) and then entering the Krebs's cycle, returning of the elasticity to skin and tone of the muscle, increasing the power and strength of atrophied muscles and stimulating the repelling of liquids gathered in the organs. These possible effects are supported by a study done by F. Amirshaghagi and R. Abdollahi on 20 non athlete Iranian women in which faradic stimulation was compared with aerobic exercises on the reduction of% fat and muscle endurance.

Similarly, IFT, HMP also proved to be effective in the reduction of abdominal fat and the possible reason for the same could be the therapeutic effects IFT and HMP i.e. relaxation of abdominal muscles, increase in local blood flow, mobilization and stimulation of a number of large muscle fibres, parasympathetic nerve fibres and breakage of fatty membrane covering the muscles respectively. This physiology is supported by a study done by Sharma P, Lehri A and Verma S.K wherein a group of young healthy females were given IFT and HMP which showed marked reduction in abdominal fat.

As clearly depicted in the results, the present study shows a more marked reduction in abdominal fat with Faradic Stimulation along with a set of exercises as compared to IFT, HMP along with a set of exercises. The possible reasons for this could be that Faradic Current causes stimulation of a large number of muscle fibres, causing an isotonic contraction of the muscle thereby causing mobilization of subcutaneous and intra-abdominal fat in such a way that the capsule covering the adipose tissue starts

to crumble down and wear off, causing the fat to loosen and get converted to Fatty acids thereby increasing the turnover of fat breakdown more effectively than the stimulation offered by IFT, HMP. Skin fold thickness measurement was taken before and after the study with the help of skin fold thickness caliper at a sight 1 inch lateral to the umbilicus and the results was interpreted in terms of comparison of both groups, pre and post interventional changes within the group. This particular method of measurement of skinfold thickness was used in a study by J. V. G. A. Durninand J. Womersley wherein skinfold thickness was measured from four sites - biceps, triceps, subscapular and supra-iliac areas to assess the body fat from total body density.

There was a reduction in skinfold thickness in both the groups post intervention, but no reduction was observed in skinfold thickness while comparing the values between both the groups thus concluding that electrical stimulation causes no effect on abdominal fat and the change in the skinfold thickness observed within the group is due to the effect of exercises on the area of thickest skinfold where in the exercises build up tone in the muscle and cause lipolysis of adipose subcutaneous tissue, this explanation is backed by a study done by Bischof M, Knechtel B, Rosemann T, on Changes in skinfold thickness and body fat in ultra-endurance cyclists.

Total body weight was measured pre and post intervention with the help of weighing scale calibrated from 0 to 150 kgs, and the results was interpreted in terms of comparison of both groups and pre and post interventional changes within the group.

In the current study, the measurement of total body was compared pre and post intervention in each group and both the groups showed significant reduction in total body weight, also a comparison of both the groups pre intervention and post intervention was done and the difference between pre and post intervention was formulated, the difference calculated was observed to be highly significant in both the groups, the cause for reduction in total body weight can be, due to the effect of reduction in abdominal circumference that might have induced the change in total body weight.

Till date the conventional treatment to reduce abdominal fat, consisted of various exercise regimens which include aerobic exercises, pilates, resistance training, several isotonic abdominal muscle exercises etc for variable time periods. Taking this into consideration a supervised exercise program consisting of 6 moderate intensity exercises viz. Curl ups, side curl ups, face down planks, side planks, alternate leg raise and alternate hand raise respectively was given along with any of the two electrical modalities of the study.

In the present study, a supervised exercise regimen was designed and administered to the participants of the study which consisted of 6 moderate intensity isotonic exercises, 10 repetition with 10 seconds hold for planks and side planks initially, progressing to 20 repetitions and 15 seconds hold after 2 weeks and 30 repetitions and 20 seconds hold by the end of 4 weeks, for a period of 4 weeks along with either of the electrical modality of the study, both the study groups show exemplary reduction in abdominal fat. This study in question was supported by a similar study conducted by Mohammad Dehganpoori<sup>1</sup>, Habib Mohammad poor<sup>2</sup>, Ali Ojaghi<sup>1</sup>, Tofiq Mahdavi<sup>1</sup> and Amine Sahranavard<sup>1</sup> on 12 healthy non-athletic male students in

the age group of 20-27years, to observe the effect of localized isotonic exercises on reduction of underskin fat and this study resulted in reduction of underskin fat in the abdominal region, the most probable reason for the effectiveness of abdominal exercises is, that the abdominal exercises help build up the tone of the abdominal muscle over which lies the abdominal fat sheath, an increase in tone causes breakage of these fatty capsules thus leading to cascade of fat metabolism. Also this particular form of muscle activation and tone built up could be explained from the EMG studies that show a higher activity of abdominal muscles during abdominal exercises, in particular obliques and core muscles.

According to the above stated reviews of literature no study has been conducted wherein a comparison has been made between the effectiveness of IFT, HMP v/s Faradic stimulation of abdominal muscles with a supervised regimen on the reduction of abdominal fat in centrally obese young individuals within the age group of 20-40 years, thus taking into consideration the statistical analysis of the study we can aptly conclude that both faradic stimulation and IFT, HMP along with a supervised exercise program reduce abdominal obesity but, Faradic stimulation of abdominal muscles along with a supervised exercise program more significantly reduces abdominal fat than compared to IFT, HMP with a supervised exercise program.

### Conclusion

From the present study we can conclude that both IFT, HMP and faradic current significantly execute a reduction in abdominal obesity in young healthy individuals under the prescribed time frame, but amongst the two, faradic stimulation of abdominal muscles show a more significant reduction in abdominal obesity than IFT, HMP. Hence Faradic stimulation of abdominal muscles can be used along with the exercise program to effectively reduce abdominal obesity.

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