Minimally Invasive Non-Dissecting Technique Otoplasty for Prominent (Bat) Ears Deformity

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ABSTRACT

Prominent ears are an inherited problem affecting 1-2% of the population (although its diagnosis is somewhat subjective and this figure depends on what is considered to be a prominent ear). It may be unilateral or bilateral and arises as a result of lack (or malformation) of cartilage during primitive ear development in intrauterine life. The ear subsequently has abnormal helical folds or grows laterally. The psychological distress caused by prominent ears can be considerable. Otoplasty can be done around the preschool age to correct the deformity. In this study, a minimally invasive non-dissecting technique under local anesthesia was described for correction of prominent ears in twenty-three adults. The technique was shown to be a rapid, safe, easy, and effective and with good satisfactory results for both the patient and the surgeon.

INTRODUCTION

Congenitally prominent ears are a cosmetic deformity that can have an emotional and behavioral effect[1]. Otoplasty is a description of surgical procedures designed to give the auricle a more natural and anatomic appearance[2].

The auricle is a complex 3-dimensional structure. The helical rim is a smooth, curved arch extending anteriorly into the helical crus that divides the concha into the superior conchae cymba and inferior conchae cavum. The helix is separated from the concha by the antihelix, an inferior single structure that bifurcates into superior and inferior crura. Between the helix and antihelix is referred to as the scapha, while between the 2 antihelical crura lays the triangular fossa. Inferiorly, there are 2 small excrescences of cartilage form the tragus and antitragus, separated by the intertragal notch. Normally, the protrusion of the auricle ranges is less than 2 cm[3].

Prominent ears are a congenital and can be an inherited problem affecting 1-2% of the population (although its diagnosis is somewhat subjective and this figure depends on what is considered to be a prominent ear). The most common causes of protrusion of the external ear are an underdeveloped or flat antihelix, an overdeveloped deep concha, or a combination of both of these features. Contributing features which may accentuate auricular prominence are protrusion of the mastoid process, prominence of the lower auricular pole (cauda helicis, lobule, and cavum concha), or a prominent, tipped upper auricular pole. About 85% of ear growth is achieved by 3 years of age and almost reach the adult size by 5-6 years of age[4,5]

Conservative correction by splinting can be done within the first 6 months of age, after that surgical correction is the option[6]. Some authors suggested surgery at age of 4 years[7] but that was not an established procedure. Timing for surgical correction is classically just at pre-school age of 5-6 years to avoid psychological troubles for the child[8]. Otoplasty is indicated for correction of ears that protrude more than 20 mm and at a cephalo-auricular angle greater than 35°. Otoplasty can be categorized into 2 main categories; either cartilage manipulating (spitting-weakening-excision) or cartilage sparing techniques. Richard et al, 2005 compared between the cartilage manipulating and cartilage sparing techniques. The outcome was analyzed subjectively by asking the patients or parents about their satisfaction, and objectively by measuring the cephalo-auricular distance at a standardized point (Frankfort line- horizontal line drawn from the infraorbital rim to the superior aspect of the external ear canal, and is used by medical photographers to align clinical photographs). It was concluded that the results were satisfactory for the patients or the patients' parents whatever the technique used for correction. It appeared the technique used is not crucial, but that the individual surgeon should be comfortable with their preferred technique[(9)].

In this study, we proposed a simple minimally invasive technique that includes percutaneous anterior scoring of the auricular cartilage (using a hypodermic needle or an intravenous cannula) combined with posterior conca-scaphal suturing involving the perichondrium and the auricular cartilage. That was performed together with excision of a posterior skin ellipse followed by skin closure without performing any dissection.

PATIENTS AND METHODS

This prospective study was done in Kasr Al Aini (Cairo University Hospitals) in addition to several private institutes. The study was performed on 23 patients with unilateral or bilateral bat ears over a period of 3 years from March 2011 to June 2014.

The study included 18 males and 5 females. The age ranged from 18 years to 29 years. Bilateral affection was present in 15 cases. While unilateral affection was in 8 cases. In all cases, the ear protrusion was more than 2 cm and cephao-auricular angle was great than 35°.

Preoperatively, all the patients performed simple routine laboratory investigations including bleeding profile, informed consent signed, preoperative photography was taken in different views, prophylactic preoperative antibiotics given just before the procedure started.

The technique was done under strict sterile conditions and by local anesthesia (being all patients included in the study were adults). The steps started by injection of saline adrenaline (1:100.000) between the auricular cartilage and skin anteriorly to induce hemostasis and provide a space to facilitate the passage of a number 18 G intravenous cannula or 21 hypodermic needle in which its beveled surface is directed laterally and its sharp edge directed towards the cartilage to perform anterior scoring along the proposed antihelix, a full thickness splitting of the cartilage was avoided to preserve a smooth fold of the anti-helix (figures 1,2,3, and 4). Three lines in the cartilage were split to weaken it so as to be easily curved. Insulin needles were inserted from the anterior surface of the auricle to come out from the posterior aspect to facilitate the placement of the sutures and also the design of the skin ellipse that will be excised. The posterior skin ellipse was incised and excised. Non-absorbable 3-4 polypropylene 4/0 sutures were taken through the perichondrium and cartilage taking care not to pierce the anterior skin, these sutures are taken from medial to lateral and parallel to the helix, then tighten leaving the knot buried and creating a new well rounded antihelical fold. The skin edges were then sutured by vertical mattress sutures without performing any dissection. Postoperatively, it was advised to splint the ear in place for continuously for 1 week and during sleep for 2 weeks. Patients were discharged on the same day. Follow up was performed, on the first day postoperatively to rule out any hematoma collection, the weekly for 2 weeks, then monthly for 3 months and lastly after 6 months. Postoperative photos were taken during each visit. Skin stitches were removed after one week. The outcome was analyzed by asking the patients about their cosmetic satisfaction, and by measuring the ear protrusion.

RESULTS

Average operative time was 15 minutes for unilateral correction. No short-term or long-term complications including overcorrection or chondritis were recorded in any of the cases. Postoperative pain score was less than 2 in all cases using the visual scoring system. The cosmetic outcome was analyzed by asking the patients about their satisfaction (poor-average-satisfied- very satisfied) and by measuring the distance of ear protrusion and the cephaloauricular angle. All the patients were very satisfie by the results and in akk cases, ear protrusion was less than 15 mm and the cephaloauricular angle less than 20°.

Fig. (1): Insertion of 18 G cannula anteriorly

Fig. (2): Passage of the cannula along the line of the proposed helical fold

Fig. (3): Starting of the anterior scoring

Fig. (4): Continuation of scoring parallel to the helix

Photo (1): Preoperative photo for a 25 years old female with ear protrusion (frontal view)

Photo (2): Preoperative photo for the same patient (lateral view)

Photo (3): Preoperative photo for the same patient (occipital view)

Photo (4): Postoperative photo for the same patient (frontal view)

Photo (5): Postoperative photo for same patient (lateral view) showing the smooth curved new antihelical fold

Photo (6): Postoperative photo for same patient (occipital view) showing the anatomical correction.

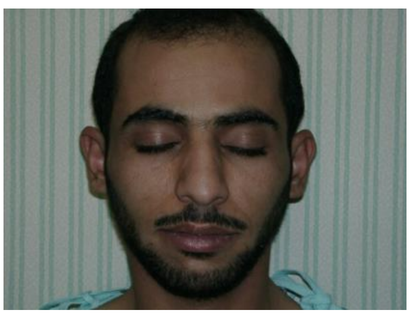

Photo (7): Preoperative photo for a patient with bat ears (frontal view)

Photo (8): Preoperative photo for a patient with bat ears (posterior view)

Photo (9): Postoperative photo for the same patient with bat ears (frontal view)

Photo (10): Postoperative picture for the same patient (posterior view)

DISCUSSION

Otoplasty is defined as the surgical correction of prominent ears, first described by Diffenbach in 1845, adapted from Edward Ely's technique described in 1841[10]. Various techniques have since developed. Those most commonly referenced: Mustarde Technique, 1962 Permanent suturing technique, conchoscaphal sutures[11] and Furnas Technique, 1959 Permanent suturing technique, conchomastoid sutures[12]. The main categories for surgery are Cartilage sparing versus cartilage manipulating techniques. The greatest problem in comparing the results of the different surgical techniques is the lack of conformity thus it was based only as being satisfactory versus unsatisfactory. When doing so, it was found that; large majority of patients are satisfied with their results regardless of technique used, parents tend to be more satisfied than the surgeon with their results, and it appears therefore that the technique used is not crucial, but that the individual surgeon should be comfortable with their preferred technique[9].

In our study, we proposed a very simple technique that can be mastered very quickly, with a short operative time, done on day-care bases, and with very minimal or almost no morbidity if done following the recommended technique. Also, it carries the advantage that it can be done under local anesthesia, avoid dissection of any auricular skin, gives a very satisfactory results for both the patients and the surgeons. Aesthetic results showed to be natural, the ear contours were soft, and the correction is uniform without leaving evidence of surgical intervention. When viewed from front, the helical rim was visible, from back the pinna appeared straight without undue prominence at upper or lower end; while in lateral view the contours were soft and natural, without evidence of manipulation.

As a conclusion, it was found that the proposed technique is an easy, easy to be adapted without a long-time for the learning curve; still it is a safe procedure with very satisfactory postoperative aesthetic outcome for both the patient and surgeon.

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Role of CT Volumetry In Evaluation of Gastric Plication

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ABSTRACT

Laparoscopic greater curve plication (LGCP) is a relatively new bariatric restrictive procedure. To our knowledge this is the first study which used Computed tomography (CT) volumetry, for quantitative as well as qualitative assessment of LGCP. CT volumetry, was used to assess the gastric pouch volume 1, 6, and 12 months following LGCP, We compared the gastric pouch volume for 30 cases performed at Cairo University, Egypt and observed the relation of the volume changes to the patients' weight loss.
Keywords: *Gastric plication, pleat, imbrication, Laparoscopic greater curve plication, GCP, LGCP, Computed tomography (CT) volumetry, pouch volume, virtual Gastroscopy, anatomical abnormalities, quantitative and qualitative assessment of LGCP*

INTRODUCTION

Morbid obesity is a growing health problem worldwide [(1)]. Clinical treatment with diet, exercise, and/or medication has not demonstrated sustainable clinically significant results [(2)]. There is substantial evidence in the literature on the long-term positive impact of bariatric surgery as a primary therapy for the treatment of obesity and its co-morbidities. Significant debate remains as to which patients are optimal candidates for which procedures [(3)].

Traditionally, the primary mechanisms through which bariatric surgery achieves its outcomes are believed to be the mechanical restriction of food intake, reduction in the absorption of ingested foods, or a combination of both [(4)]. Laparoscopic adjustable gastric banding (LAGB) and vertical sleeve gastrectomy (VSG) are restrictive approaches commonly used in bariatric practice [(5) (6)]. Although these procedures have proven to be good therapeutic options for some patients, they are not without significant complications, such as erosion or slippage of the gastric band or gastric leaks in VSG [(7) (8)]. Leaks in VSG pose a particular difficult challenge when they occur near the angle of Hiss, potentially generating severe clinical conditions that require reoperation and may even cause death [(8)].

An alternative procedure that can be as restrictive as sleeve gastrectomy is laparoscopic gastric plication (LGP), a restrictive bariatric surgical technique that has the potential to eliminate the complications associated with LAGB and VSG by creating restriction without the use of an implant and without gastric resection and stapling and at a much lower cost [(9)].

LGP is an emerging procedure that requires additional studies to assess long-term efficacy. Initial studies suggest that LGP may provide effective surgical weight loss with a potentially lower risk profile than other bariatric procedures [(10)].

CT volumetry has proven its efficacy in evaluation of the volume of other organs, such as the liver, but has not been widely used in assessing the stomach. More research is needed in order to prove its accuracy with this particular organ, which, if done, should provide a true evolution in the prediction of the outcome of the restrictive bariatric procedures [(11)].

Virtual gastroscopy is another radiographic study that uses three-dimensional (3-D) computed tomography (CT) data to simulate conventional upper endoscopy images that are artificially generated by a computer [(12)].

AIM OF THE STUDY

The purpose of this study was to evaluate the relation between CT volumetric results and the weight loss after Laparoscopic Gastric Plication for treatment of morbid obesity. An overview of the technique and its outcomes is discussed and evaluated over a 12-month period for 30 cases performed at Cairo University.

PATIENTS & METHODS

The present study included 30 randomly selected morbidly obese patients who underwent LGCP at kasr el Aini hospital, Cairo University after the approval of the ethical committee between May 2010 & October 2012.

The patients' ages ranged from 18 to 48 years old with a mean of 32.7 years. Out of 30 patients 21 were females and 9 were males. Preoperative BMI ranged from 40 to 62 kg/m2 with a mean BMI of 50.6 kg/m2. Patients were informed about the nature of the research, and each patient understood and agreed to the procedure.

All patients underwent a standard evaluation preoperatively. Blood tests were requested in the form of complete blood picture, Fasting blood sugar, HbA1c, Lipid profile (cholesterol, LDL, HDL, triglycerides) Clinical chemistries (serum albumin, ALT, AST, GGT, Urea, Creatinine) and Prothrombin time and concentration. Abdominal ultrasonography, chest X-ray, Pulmonary function tests and Upper endoscopy were performed preoperatively.

Prior to surgery, patients were asked to consume low fat foods and avoid fried food items. Moreover, the patients were also asked to stop consuming sugar and to switch to sugar substitutes wean off from carbonated drinks.

Surgical Procedures

All surgical procedures took place under general anesthesia with the patient in supine position with 30 degrees reverse trendlenberg and legs open. Closed pneumoperitoneum was achieved then a five-trocar port technique similar to that used in laparoscopic sleeve gastrectomy was used. Trocar placement was as follows: one 10-mm trocar above and slightly to the right of the umbilicus for the 45 degree telescope; one 10-mm trocar in the upper right quadrant (URQ) for passing the needle, for suturing, and for the surgeon's right hand; one 5-mm trocar also in the URQ below the 10-mm trocar at the axillary line for the surgeon's assistant; one 10-mm trocar below the xiphoid process for liver retraction; and one 5-mm trocar in the upper left quadrant (ULQ) for the surgeon's left hand (Fig. 1). The procedure began with dissection of the Greater curvature from attached omentum using Ligasure (Covedien) or Harmonic scalpel (Ethicon Endo-Surgery) and opening the greater omentum at the transition between the gastric antrum and gastric body. Once access to the posterior wall was achieved, the greater curvature vessels were dissected proximally up to the Angle of His and distally until 4cm from the pylorus. Posterior gastric adhesions were also dissected to allow optimal freedom for creating and sizing the invagination properly.

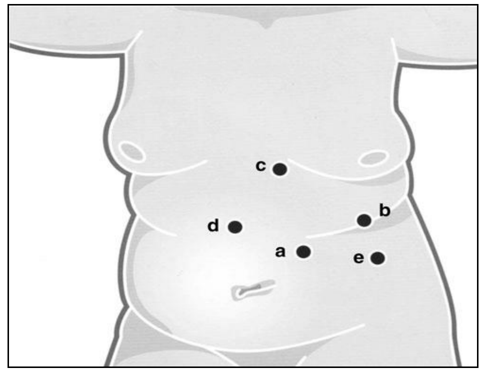

Fig. (1): Trocar position: A) 10mm above the umbilicus slightly to the right; B) 10mm in URQ; C) 10mm below xiphoid process; D) 5mm in the ULQ; E) 5mm on the URQ at the axilary line

After release of the greater curvature Plication was started at the angle of Hiss and continued to 4cm from the pylorus over a 36 Fr. Bougie using an extra-mucosal running suture line of 0-0 Prolene™ (Ethicon, Inc., Somerville, NJ, USA). The suture material was then knotted and a second running suture line applied ending at the angle of Hiss. The distance between each stitch and lesser curvature was 2cm anteriorly as well as posteriorly. The distance between each stitch and the following stitch was 2cm as well. Care was taken to keep the stitches extramucosal. The reduction resulted in a stomach shaped like a large sleeve gastrectomy. Leak tests were performed with methylene blue and then repeated with air in all cases. One drain was left in place and ports closed. All intra-operative videos were digitally recorded.

In the postoperative period, patients were discharged as soon as they accepted a liquid diet without vomiting. The postoperative diet was prescribed with a progressive return to solid foods in a stepwise fashion.

The weight was measured at the initial screening visit, 1 month, 6 months, and 12 months after surgery. CT volumetric and Virtual gastroscopic evaluations were scheduled for 1, 6, and 12 months.

CT volumetry requires that the subjects fasted for at least 8 hours and then received 6 g of gas-producing crystals with 10ml water orally which enabled distension of the stomach before the procedure was performed. The subjects were then placed in the supine position with his/her right side elevated at approximately 30°. To ensure adequate gastric distension, a scan gram was first obtained. An additional 3 g of gas-producing crystals was given to subjects determined to have insufficient air distension. CT scan was obtained from the diaphragmatic domes to 2 cm below the lower margin of the air distended gastric body

By means of this method, the total volume of the stomach was calculated with the aid of several cylindrical partial volumes. The partial volumes resulted from segmentation of the stomach into adjoining parallel sections of identical thickness. Each partial volume was calculated as a product of its base and the constant section thickness selected.

Virtual upper gastroscopy is a minimally invasive test that was also conducted in which three-dimensional (3-D) computed tomography (CT) were used to create a virtual image that is artificially generated by a computer to simulate conventional upper endoscopy images.

All available data was placed in Excel spreadsheet software and the data analyzed.

RESULTS

The absolute weight decreased at 1 month postoperative by a mean of 16.1 kg with a range of 3.6 kilograms (kg) to 27.5 kg. The absolute weight decreased at 6 months postoperative by a mean of 29.3 kg with a total weight loss range of 12 kg to 51 kg. The absolute weight decreased at 12 months postoperative by a mean of 36 kg with a total weight loss range of 4 kg to 71 kg as shown in figure (2).

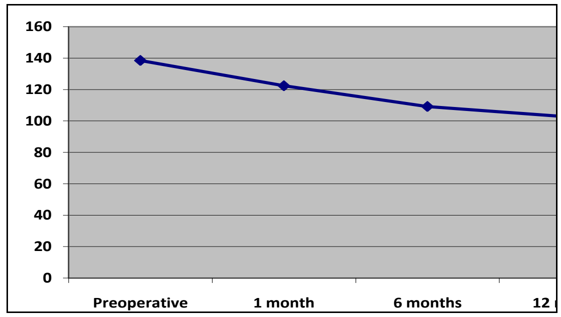

Fig. (2): The mean absolute weight preoperative, 1 month, 6 months, and 12 months postoperative

The mean BMI decreased at 1 month to 44.7 kg/m2 (34.7 – 56.1 kg/m2). At 6 months the mean BMI was 39.9 kg/m2 (28.5 – 52.8 kg/m2), and after 1 year the mean BMI was 37.5 kg/m2 (25.1 – 51.9 kg/m2). The BMI of all patients over a 12 months period is shown in figure (3). While the mean BMI over 12 months is shown in figure (4). The BMI decreased at 1 month postoperative by a mean of 5.9 kg/m2 with a range of 1.4 kg/m2 to 10.8 kg/m2. The BMI decreased at 6 months postoperative by a mean of 10.7 kg/m2 with a range of 4.6 kg/m2 to 17.4 kg/m2. The BMI decreased at 12 months postoperative by a mean of 13.2 kg/m2 with a range of 1.5 kg/m2 to 26 kg/m2.

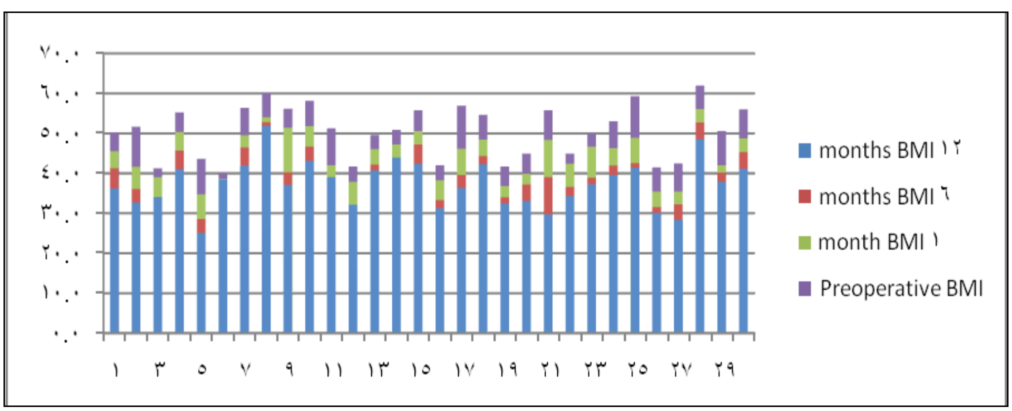

Fig. (3): The BMI of all patients preoperative, 1 month, 6 months, and 12 months postoperative

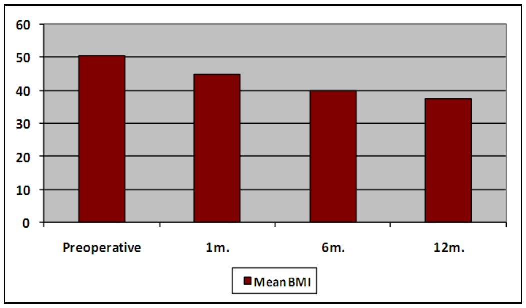

Fig. (4): The mean BMI preoperative, 1 month, 6 months, and 12 months postoperative

The % excess body weight loss ranged from 9.1 % to 47.7 % with a mean of 23.5 % after 1 month. After 6 months, the % excess body weight loss ranged from 21.1 % to 80.9 % with a mean of 43.5 %. While After 12 months, the excess body weight loss ranged from 10.2 % to 99.6 % with a mean of 52.4 %.

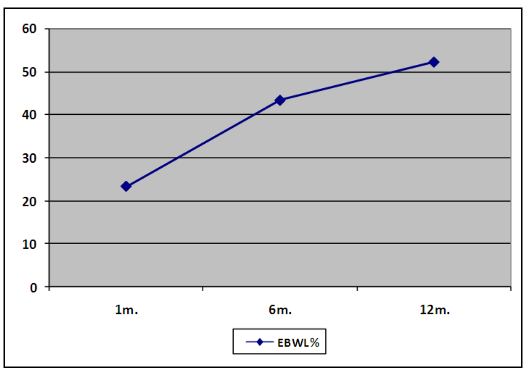

Fig. (5): The mean % EBWL at 1 month, 6 months, and 12 months postoperative

The pouch volume ranged 1 month postoperative from 128 cm3 to 446 cm3 with a mean of 248 cm3. This volume ranged 6 months postoperative from 168 cm3 to 573 cm3 with a mean of 356.5 cm3. The volume at 12 months postoperative ranged from 277 cm3 to 822.2 cm3 with a mean of 458.1 cm3.

The pouch volume increased at 6 months postoperative by a mean of 108.6 cm3 with a range of 28 cm3 to 307 cm3. The volume increased at 12 months postoperative by a mean of 210.2 cm3 with a range of -35.1 cm3 to 499.2 cm3 from the pouch volume at 1 month postoperative as shown in figure (6)

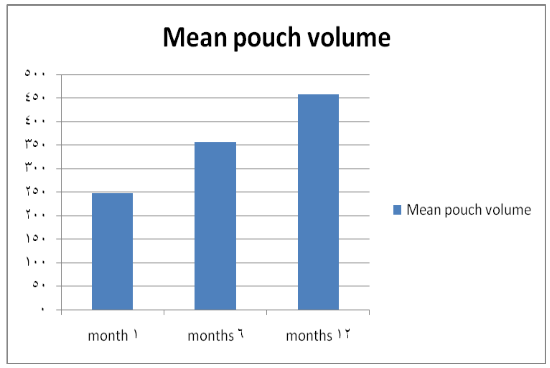

Fig. (6): The mean pouch volume at 1 month, 6 months, and 12 months postoperative

Qualitatively CT volumetry suggested that the initial greater curvature fold was smaller at 6 months when compared with the initial fold size at 1 month but appears unchanged at 12 months.

The mean operative time was 154 min (100 to 210 min). Operative time was shown to decrease by time. The mean operative time was 163.6 min. (120 – 210 min.) in the first 22 cases who underwent surgery in 2010, while it decreased to 130 min. (100 – 150 min.) in the last 8 cases who underwent surgery in 2011.

DISCUSSION

The mean BMI decreased at 1 month to 44.7 kg/m2 (34.7 – 56.1 kg/m2). At 6 months the mean BMI was 39.9 kg/m2 (28.5 – 52.8 kg/m2), and after 1 year the mean BMI was 37.5 kg/m2 (25.1 – 51.9 kg/m2).

The BMI decreased after 12 months postoperative by a mean of 13.2 kg/m2 with a range of 1.5 kg/m2 to 26 kg/m2. In the study by Brethauer S. et. al., the mean BMI decreased by 24.4 Kg/m2[13]. The difference could possibly be due the smaller preoperative BMI in the study by Brethauer S. et. al. 43.3 Kg/m2 (range 36.9 – 49 Kg/m2) compared to our study with a mean BMI of 50.6 kg/m2 (range 40 - 62 kg/m2).

All the patients have lost weight significantly after 1 month, 6 months and 12 months with a mean % Excess Body Weight Loss of 23.5, 43.5% and 52.4% respectively. The results were comparable and close to the results of Brethauer S. et.al., Ramos et. Al, and Talebpour et. al. results published in 2007 and 2010[13,9,14,15].

In our study, we measured the pouch volume after 1 month which showed a mean volume of 248 cm3 which increased after 6 months to 356.5 cm3 and after 12 months to 458.1 cm3. The pouch volume increased gradually in most but not all patients which suggests that patient factors of gradual overstretching of the pouch may play a role. Therefore gradual eating beyond satiety and thus gradual stretching of the pouch should be avoided.

The percentage pouch volume increase was compared at 6 months and 12 months postoperative. The mean gastric pouch increased in patients after 6 months by 47.8% (108.6 cm3) and after 12 months the pouch further increased by a mean of 43.6 % (101.6 cm3) of the mean volume at 1 month.

The mean % pouch volume increase in patients was compared to % EBWL at 6 months and 12 months and it was found that a mean % pouch volume increase of 47.8% was associated with a mean %EBWL of 43.5%. Over the next 6 months. The mean % pouch volume increased by a further 43.6%. This was associated with a mean % EBWL of 52.4 (8.9% more than the mean %EBWL at 6 months). Therefore if the mean % EBWL at 6 months is considered theoretically constant in the next 6 months, an increase of mean % pouch volume by 43.6 decreased the potential weight loss by 34.7%. Therefore it can be deduced that an increase in pouch volume strongly correlates with a decrease in %EBWL.

The % pouch volume increase at 6 months was compared and found to strongly correlate with the % EBWL at 6 months.The % pouch volume increase at 6 months was also found to be a strong predictor of the % EBWL at 12.

The % pouch volume increase at 12 months was also compared and found to strongly correlate with the % EBWL at 12 months and will also probably be a strong predictor of the % EBWL in the following period.

Analyzing this data, we observed that 13/15(86.6%) who had significant weight loss (>50% of EBWL), had a smaller pouch volume (<250cm3) following LGCP. Moreover, 9/15 (60%) of the patients who had significant weight loss had a lower percentage of increased gastric pouch volume in the first 6 months (≤ 55% increase in the pouch volume) i.e. the lesser the increase of the pouch volume, the more the weight loss of the patients. This is shown in figure (7)

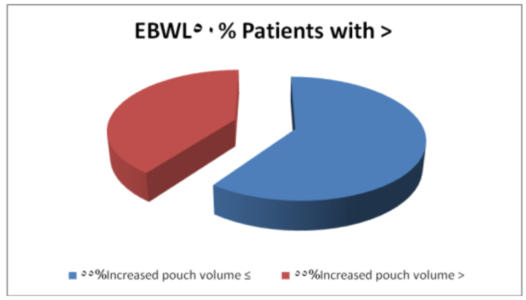

Fig. (7): Relation between %EBWL and % increased Pouch Volume

Therefore it can be concluded that the pouch volume following LGCP and the percentage of volume increase of this pouch are two important factors in determining the weight loss of the patients. However this relation was not proven in 100% of the patients which highlights the possible effect of other factors such as hormonal factor or the increased rate of pouch evacuation.

CONCLUSIONS

It can be emphasized that CT volumetry is mandatory in evaluation of EBWL in relation to the dilated gastric pouch and further study to determine the exact end point for predictability of outcome in relation to pouch volume must be studied.

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