Tumescent Liposuction And Excision Vs Surgical Excision: A Comparitive Study For Management Of Subcutaneous Lipomas

by

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Dissertation submitted to

In partial fulfillment for the degree of

MASTER OF SURGERY

IN

GENERAL SURGERY

Under the guidance of

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2019

ABSTRACT

AIMS AND OBJECTIVE: Lipomas are most common benign soft tissue tumor, occurring in about 1% population and in 4^{th} to 6^{th} decade of life. It is typically painless in subcutaneous plane. It requires excision only when it is symptomatic or for aesthetic purposes. They are typically removed by conventional surgical excision. Liposuction is a safe alternative and cosmetically better. Since liposuction alone has drawbacks of leaving capsule that predisposes to recurrence, it is combined with extraction. This study aims at comparing conventional excision with tumescent liposuction with excision for subcutaneous lipomas. The post-operative complications and the aesthetic value of the two procedures are compared.

MATERIALS AND METHODS: This was a prospective study conducted at BLDEU's Shri B. M. Patil Medical College Hospital and Research Centre, Vijayapura from Nov 2017 to May 2019 and included 92 patients with subcutaneous lipoma. These patients were divided into 2 groups liposuction with excision (L) and excision (C) group with 46 patients in each group. L group underwent liposuction with tumescent anaesthesia with excision through same incision and C group underwent conventional surgical excision. The postoperative pain, ecchymosis, bleeding, seroma and scar size were assessed. The cases were followed up to 3months.

RESULTS: The lipomas in subcutaneous plane in various parts of the body mostly in extremities, back and nape of neck were studied. The size of the lipoma ranged from 2-10cm with mean diameter of 5cm and 5.1cm in group L and C respectively. The pain score with VAS score was 3.2 in Group L and 4.3 in Group C and is statistically significant with p-value <0.001. 24 patients (52.2 %) in Group L developed ecchymosis post-operatively and resolved in one week. This is statistically significant with p-value <0.001. 3 patients in Group L and 1 patient in group C developed hematoma. 4 patients in Group L and 5 patients in Group C

developed seroma in large lipoma which resolved with no further intervention. 2 patients in Group L developed infection post-operatively. All the cases in group L has a scar of less than 1 cm and in L group the scar size was more than 1 cm. This is statistically significant with p-value <0.001. No recurrence has been noted in any of the cases in both the groups so far.

CONCLUSION: Combined liposuction and excision is a much safer alternative for lipoma removal than surgical excision and cosmetically better inspite of having minor self-resolving complication like ecchymosis. But long term follow up needed to know the recurrence rate.

LIST OF ABBREVATIONS

FDA	Food & Drug Administration
MGG	May-Grunwald Giemsa
FNAC	Fine Needle Aspiration Cytology
CT	Computed Tomography
MRI	Magnetic Resonant Imaging
HIFU	High Intensity Focused Ultrasound
PDC	Phosphatidyl Choline
DC	Deoxycholate
CCH	Collagenase Clostridium Histolyticum
VAS	Visual Analogue Score
HIV	Human Immunodeficiency Virus
HBsAg	Hepatitis B Antigen
HPR	Histo Pathological Report
BT/CT	Bleeding Time/ Clotting Time

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1. INTRODUCTION

Lipoma is the most common benign soft tissue tumor composed of the subcutaneous fat tissue. It prevails in about 1% population. It usually occurs in 4^{th} to 6^{th} decade of life. (1) It is mostly painless and usually found in subcutaneous plane. It can occur anywhere in the body. But they are usually seen over the forearms, trunk and at the nape of the neck. A surgical intervention is required only when there are symptoms like pain due to pressure or restriction of movement or for aesthetic reasons. (2)

The only remedy for lipomas is surgeries. There are many surgical ways in which lipomas can be removed. Lipomas are usually abolished traditionally by conventional surgical excision which is likely to give rise to complications like bleeding, infection, seroma formation, big scars and recurrence. To curtail the scar and in cosmetic point of view, liposuction is a secured alternative. Liposuction has been approved as the most effective alternative for lipoma excision by FDA Food and Drug Administration).(2) Since liposuction alone has its own setbacks of leaving residual tissue/ capsule that would lead to recurrence, liposuction is combined with extraction of capsule / remaining tissue through the same incision. The added advantage of liposuction is that multiple lipoma nearby can be removed by single incision. (3)

These lipomas can be removed under various anaesthesia based on the site of the lipoma. It can be general anaesthesia, local anaesthesia or regional blocks. But the usage of tumescent anaesthesia in case of liposuction has its own advantages of minimising the bleeding (4)

In our institution, lipomas, till date, were subjected to conventional surgical excision alone. By introducing this study, lipomas were removed by combined tumescent liposuction and extraction. This procedure was compared to conventional surgical excision with post-

operative complications like scarring, seroma formation, infections, recurrence etc. and both these procedures was analogized in cosmetic point of view.

2. AIM AND OBJECTIVE OF THE STUDY

AIM:

TO COMPARE TWO SURGICAL MODALITIES: TUMESCENT LIPOSUCTION WITH EXCISION VS SURGICAL EXCISION IN MANAGEMENT OF SUBCUTANEOUS LIPOMAS

OBJECTIVES:

TO COMPARE THE FOLLOWING POST OPERATIVE PARAMETERS IN BOTH MODALITIES:

1. PAIN
2. SEROMA FORMATION
3. INFECTION
4. HEMATOMA
5. BLEEDING.
6. SCARRING AND COSMESIS
7. RECURRENCE

3. RESEARCH HYPOTHESIS:

Combined liposuction and excision are a much safer alternative for lipoma removal than surgical excision. Liposuction performed through small incision provides satisfactory aesthetic results. (5)

4.REVIEW OF LITERATURE:

ANATOMICAL CONSIDERATIONS:

Fat cells below the skin has a specific structure. It is made into lobules which is separated by the fibrous septae. This fat under the skin plays protective role of being a thermoregulator. The adipose cells in these lobules are rich in triglycerides. The in-between septae are made of collagen and contain the neurovascular bundles with lymphatics. (6) The subcutaneous fat is divided into three layers: superficial (apical and mantle), intermediate and deep as depicted in FIGURE 1. The layers that are targeted for removal is intermediate and deep for uniform reduction. For hi definition liposuction the superficial layer is targeted. But the risk of injury to vascular bundle and alteration of body contour when the superficial layer is attacked. Apical layer is below reticular dermis. It surrounds the sweat glands and hair follicles. In deeper parts of the apical region is the vascular and lymphatics. These layers are rich in carotenoids, hence the yellow colour. This layer is avoided because of the vascular and neural content. If this layer is extensively destroyed it will result in seroma, erythema and hyperpigmentation. Sometimes may also give rise to necrosis of the skin. These complications have decreased in this modern time because the usage of micro cannulas of 2-3 mm diameter has replaced the larger diameter cannulas. (7)

The mantle layer of the fat has columnar shaped cells. It is separated from the deep layers of fat by fascia- like tissue. This layer is absent in eyelids, nail beds, bridge of nose and penis. They help the skin withstand the trauma by taking the external pressure.

The shape and thickness of the deep layer depends on the type of the food an individual consumes, sex and genes. This is the best layer for liposuction. The fat cells here are arranged as globules separated by fibrous septa which are in tangential and oblique directions. The tangential arrangement is thicker compared to the oblique planes.

There are “zones of adherence” where the cutaneous layer is tightly adherent to the underlying fascia.

• Lateral gluteal depression

• Gluteal crease

• Posterior thigh above the popliteal fossa

• Inferolateral iliotibial tract region

• Medial mid-thigh (8)

The growth of these adipose cells is directly proportional to the gain in weight of the body. The lipocytes may increase in the volume or the weight gain triggers the growth of mesenchymal stem cells that gets converted to adipose cells. On maintaining proper diet and vigorous exercise the number of fat cells remain unaltered but there is reduction in the size of the fat cells as depicted in Figure 2. The neo-adipose cells are referred as “resistant fat”. (9) When a normally growing adipose tissue goes in for an abnormal growth it is called lipomatous tumours.

FIGURE 1: LAYERS OF SUBCUTANEOUS FAT

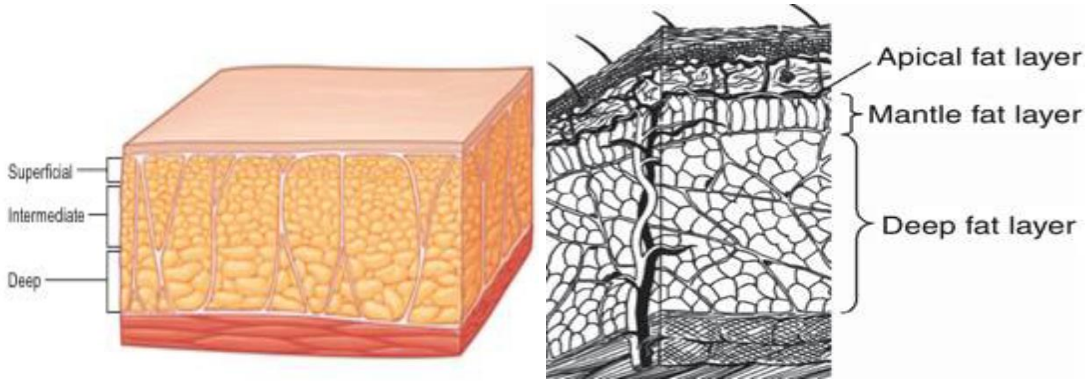


FIGURE 2: IMPACT ON ADIPOSE CELLS ON WEIGHT GAIN AND WEIGHT LOSS.

LIPOMA:

Lipomas are benign soft tissue tumour that are made of mainly fat tissue. It affects 1% of the population of age group 30-50 years. There can be present in various locations but mostly seen in subcutaneous plane. It ranges in size and is slow growing, painless bumps appearing under the skin. It has smooth surface and soft to feel. Sometimes can also have rubbery or doughy feel. They occur usually as oval or round mass with no changes in the surrounding skin. It occurs anywhere in the body. But most commonly occurring in forearms, trunk and nape of neck. The lipomas are usually asymptomatic unless it has been progressed to such a large size that causes compression of nerve causing pain. These lipomas may present as solitary lump or many in number all over the body. In men usually, it presents as multiple lumps and in women as solitary lump. These lipomas can be present in any organ including the brain, parotid gland, tendon, gastrointestinal system and bone marrow. (10)

EPIDIMOLOGY:

Lipomas can be either inherited or can be sporadic. The lipomas that are inherited are: diffuse congenital lipomatosis, Madelung's disease, multiple lipomatosis that run in the family and Dercum's disease. In diffuse congenital lipomatosis there are lipomas made of immature cells over the torso which is not well demarcated. They are usually in the intramuscular plane and thus its removal is a challenge surgically. Madelung's disease is also named as benign symmetric lipomatosis. This condition was described first in 1888. (11) The occurrence of this is more common in male than in female by 4 times. The usual sites of involvement are head, neck and shoulders. In such cases usually there will be a supportive history of excess alcohol intake and diabetes. It occurs usually in combinations of other problems like upper airway tumours, raised urea level in blood, obesity, renal tubular acidosis and with liver disorders. An autosomal dominant condition seen in adolescents named familial lipomatosis will involve many, small, encapsulated over upper and lower limbs. The involvement of neck

and shoulder is rarely seen. A rare disease named Dercum's disease which is also known as adiposis dolorosa has pain as its main component. This condition usually affects women in post-menopausal age and who are obese. It usually involves the extremities. They may also present with emotional instability, uncontrolled alcohol consumption, history of localized trauma and may be depressed. They are usually false lipomas since they don't have capsule around them.

The patients of any age after puberty can present to us with lipoma. They usually present as having the swelling for many years.

ETIOLOGY:

The lipomas are similar to normal fat tissue histologically. When the lipoma is completely removed and examined under microscope the capsule surrounding the fat cell aggregates are seen. Biochemically also the fat cells differ from that of lipoma tissue. The lipoma has raised levels of lipoprotein lipase. (12)

There are uncertainties regarding the cause of lipoma. It has been hypothesized that trauma leads to herniation of fat that creates false lipomas. Another postulate is that the trauma causes stimulation of cytokine and causes pre-adipocyte differentiation. But these are not proven hypothesis. (2)

The role of HMGA1 rearrangements in causing lipoma is being demonstrated by a recent study made by Pierantoni et al. (13) The study conducted by Ashar et al showed that there are chromosomal abnormalities in 12q14 gene in both malignant and benign variant of lipoma. (14) There are genetic mutations affecting organelles like mitochondria that gives rise to multiple lipoma. There is a variant named spindle cell lipoma that are not commonly seen and has fat cells and bland spindle cells in a fibromyxoid background.

CLASSIFICATION OF LIPOMA:

"The World Health Organization Committee for the Classification of Soft Tissue Tumours divides benign lipomatous tumours into nine distinct diagnoses:

1.lipoma

2.lipomatosis

3.lipomatosis of the nerve

4.lipoblastoma

5.angiolipoma

6.myolipoma of soft tissue

7.chondroid lipoma

8. spindle-cell lipoma/pleomorphic lipoma

9. hibernoma." (15)

CLASSIFICATION OF LIPOMA BASED ON LOCATION:

1. Subcutaneous: Lipomas arising in subcutaneous tissue plane

2. Sub fascial: Lipomas arising from fat cells lying deep to the deep fascia

3. Intramuscular: Lipomas arising from the fat cell lying in between the muscle fibres

4. Sub serous: Lipoma arising from the fat cells lying in the sub serous plane of the gut

5. Submucous: Lipoma arising from the fat cells lying in the submucous layer in respiratory and gastrointestinal tract

6. Sub synovial: Lipoma arising from fat cell lying deep to the synovial membrane lining the joint

7. Periosteal: Lipoma arising from fat cells lying deep to the periosteal lining the bone

8. Intra-articular: Lipomas arising from fat cells lying within the joint

9. Extradural: Lipomas arising from the fat cells lying in the extradural space in the spinal canal.

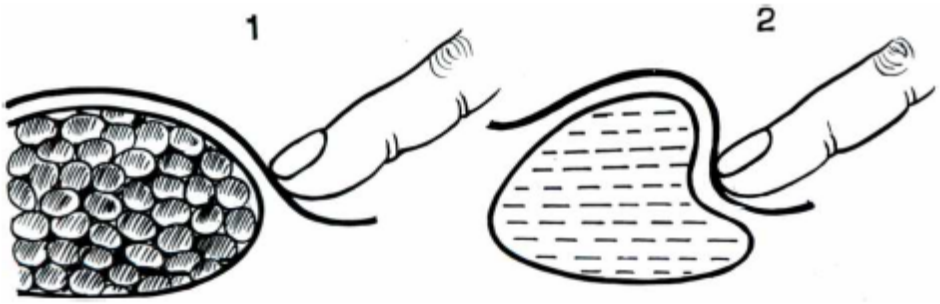
Intracranial extradural lipoma does not occur as there is no fat cell in the cranial cavity

10. Intraglandular: Lipomas arising from the fat cells lying within the gland—breast and salivary glands.

DIAGNOSIS:

Usually diagnosis is only based on physical examination. History of sudden increase in size, pain and other changes are noted. History of patient coming with lipoma will be complaints of swelling since many years. Usually does not present with pain. Gradual progression of the size is noted. Sudden increase in size goes in favour of malignant changes. There are no complaints of skin changes or itching or any discharge from the swelling. On examination the swellings may be present anywhere in the body. They are usually soft in consistency and sometimes may present as firm swelling. There are no skin changes in benign lipoma. There are no engorged veins. The lipoma may be visible or may be felt on palpation There are no punctum. Usually the benign variant has smooth surface with well-defined margins. There is no tenderness or local rise of temperature. The SLIP SIGN is positive as depicted in the figure.3. When the edge of the swelling is palpated, the margin of the swelling does not yield to the palpating finger and the swelling slips away. This is not seen in cystic swellings. The fluctuation test is false positive in case of lipoma. The skin over the swelling is pinchable in case of subcutaneous lipomas and is not adherent to the underlying muscles or structures. When the size of the lipoma crosses beyond 5 cm or it causes restriction of movements, or there is history of rapid growth of the swelling and when there are cosmetic issues, the lipoma can be excised. (16)

FIGURE 3 : SLIP SIGN DEMOSTRATION.



The cause of lipoma formation remains doubtful. Before taking the patient for surgery certain preoperative tests are performed that aids in coming to a definitive diagnosis.

PATHOLOGICAL DIAGNOSIS:

Fine needle aspiration cytology for lipomas almost given an accurate diagnosis. Additional biopsy helps in concluding the diagnosis. There may be sometimes complications associated with this procedure like local haemorrhage. Otherwise it's a safe procedure and is less traumatic. Seedling along the tract is rare. (17)

10 cc or 20 cc syringe, pistol handle and 22-gauge needle is used and multiple site samples are taken. Immediately Giemsa staining can be done to get an idea regarding the adequacy of the sample. Both air dried or alcohol fixed smears can be used for MGG and Papanicolaou (or H & E) staining. Samples can be collected for cell block for immunohistochemistry and ancillary studies. (18)

The FNAC of lipoma as shown in FIGURE 4, 5. shows there are clusters of matured adipose tissue which has vacuolated cytoplasm and is large in size. There is round nucleus which are pyknotic and are placed at the centre or at the side of the cell. The smears have histiocytes surrounded by thin capillaries. (19)

FIGURE 4: FNAC OF LIPOMA

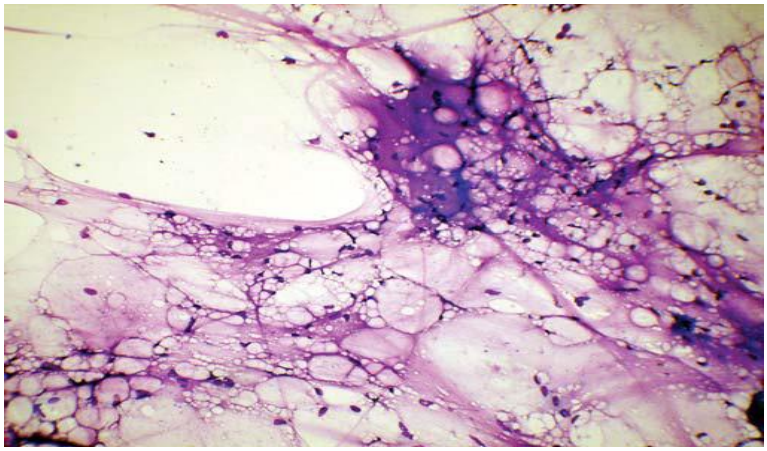
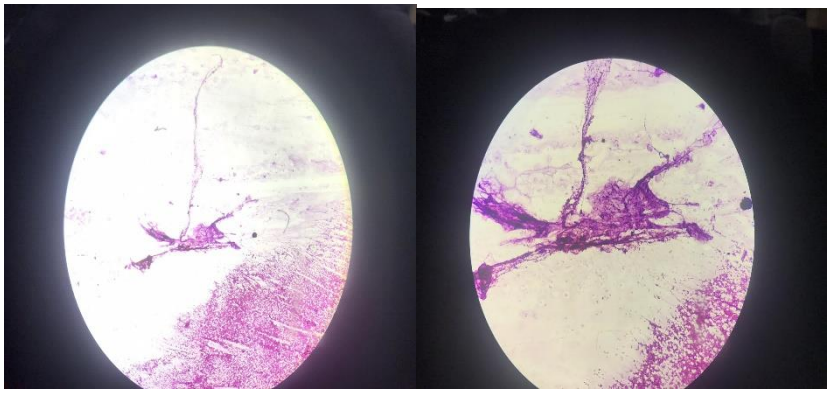
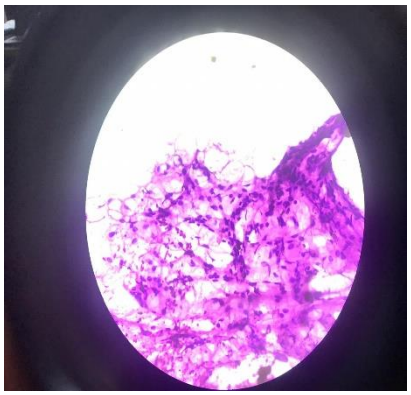


FIGURE 5: FNAC OF LIPOMA IN LOW POWER, 10X AND 40 X MAGNIFICATION





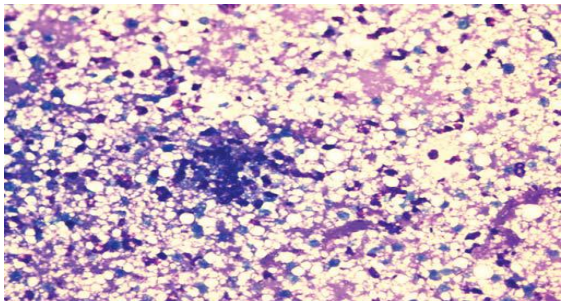
There are many variations among the lipomas: myolipoma, angiolipoma, spindle cell and pleomorphic lipoma. These are benign conditions. Among the malignant ones are the de

differentiated liposarcoma, myxoid liposarcoma, pleomorphic liposarcoma, mixed type and not otherwise specified variety. The locally aggressive ones are the atypical lipomatous tumour and well – differentiated liposarcoma.

PLEOMORPHIC LIPOMA

FIGURE 6 Shows large hyperchromatic nuclei and floret cells along with the fat cells. In the floret cells many numbers of nuclei are arranged in circular or semi-circular pattern. There are no lipoblasts.

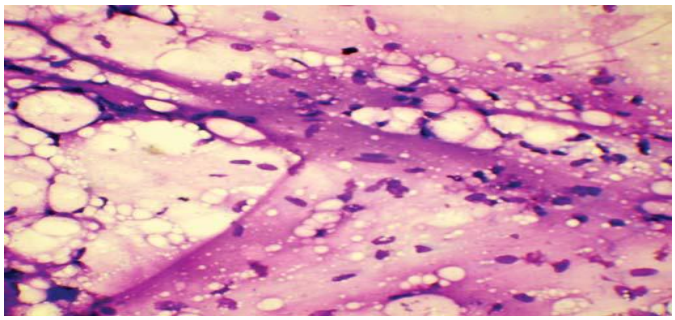
FIGURE 6: PLEOMORPHIC LIPOMA



SPLINDLE CELL LIPOMA

FIGURE 7 Shows fat cells and spindle cells that are arranged as small fascicles. These spindle cells have bland like nuclei. They also contain mast cells and collagen bundles with no lipoblasts. (20)

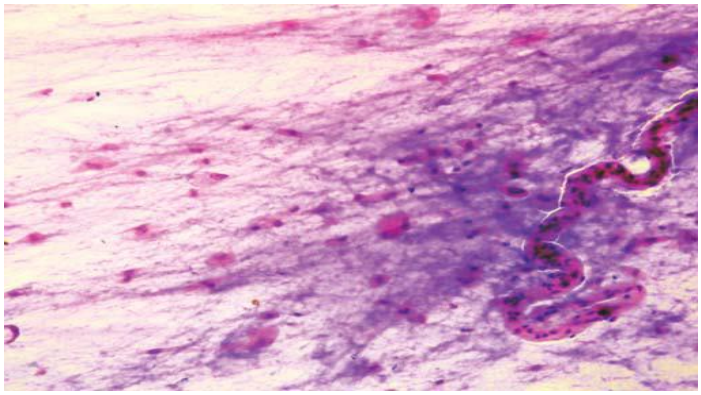
FIGURE 7: SPINDLE CELL LIPOMA



ANIGOLIPOMA

FIGURE 8 shows multiple branching blood capillaries amidst the fat cells. Mast cells are present.

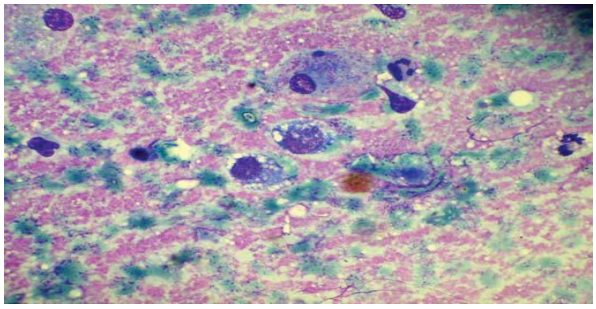
FIGURE 8: ANGIOLIPOMA



WELL DIFFERENTIATED LIPOSCARCOMA

FIGURE 9 shows large round – polygonal fat cells with enlarged pleomorphic nuclei and lipoblast. The fat cells have many vacuoles in the cytoplasm. (21)

FIGURE 9: LIPOSARCOMA



Kapila et al. studied the fine needle aspiration cytology of lipoma and found that it is easy to diagnose lipoma. The role of FNAC is not reliable in case of malignancy and variants. (19)

RADIOLOGICAL STUDIES: these include ultrasound, computed tomography (CT) or magnetic resonant imaging (MRI).

The findings on doing ultrasound are variations of echogenic patterns. This depends on where the lipoma is present and the way the mass is composed. They are usually masses of either hypo, hyper or mixed echogenicity. They are oval shaped masses that are separated by capsules. To distinguish if the tumour is malignant or benign tumours, the colour sonography is done. But ultrasound is done when the mass is suspicious to be lipoma. It also helps in doing ultrasound guided FNAC and liposuction. Futani et al made a study of using grey scale to differentiate the lipoma in intramuscular plane with that of liposarcoma that is well differentiated. But this study showed no difference between the two. However, on conducting power doppler the well differentiated liposarcoma showed two flow velocity signals but only 11 % of them showed two flow velocity among those who had intramuscular lipoma. The well differentiated liposarcoma shows occupancy of more than 30% of colour flow signals but the intramuscular lipomas have low colour-dot ratios. This finding corresponds to the fact that there is increased vascularity in case of liposarcomas. (22)

The CT scans have the ability to measure the density values of the equivalent fat tissue and also helps in ruling out the other possible differential diagnosis of swelling in subcutaneous planes. The study conducting by Thompson et al. showed that the accuracy of diagnosing lipoma using CT was seen in eight out of nine patients. The masses in the deeper planes can also be diagnosed using the CT scan. (23)

In order to diagnose the fat cells using MRI scan, a T1 weighted fat suppression sequence is used that shows a chemical shift. It also helps in ruling out the other differential diagnosis of subcutaneous swellings. The efficiency of using MRI to distinguish the benign and well differentiated liposarcoma was tested by Ohguri et al. The malignant tissue showed thick septa and intermittent non-fatty cells components amidst the fatty cells. Whereas in benign lesion the septa were not enhancing and had irregular margins. (24)

DIFFERENTIAL DIAGNOSIS

The various differential diagnosis of lipoma is:

1.Vascular nodules

2.Rheumatic nodules

3.Sarcoidosis

4.Infections (e.g., onchocerciasis, loiasis)

5.Hematoma

6.Ganglion cyst

7.Angiolipomasa

8.Hibernomas

9.Neurofibromas

10.Epidermoid cysts

11.Erythema nodosum

12.Nodular subcutaneous fat necrosis

13.Weber–Christian panniculitis

14.Desmoid tumor

15.Malignant

16.Lipoblastomas

17.Liposarcomas

18.Metastatic disease (10)

COMPLICATIONS OF LIPOMA:

There are various complications of lipoma like:

1. Cosmetic deformity owing to the large size
2. Saponification
3. Calcifications
4. Myxomatous
5. Rarely malignant change – LIPOSARCOMA which is indicated by rapid increase in size, distant metastatic symptoms, rise of temperature over the lipoma, enlarged veins and becomes fixed by infiltrating to underlying structures.
6. Infection
7. Haemorrhage

MULTIPLE SYMMETRICAL LIPOMATOSIS (MSL)

MSL is a rare disease. It was first reported by Brodie in 1846. (25) They are also called "Madelung's disease, Launois- Bensuade syndrome and lipoma annulare coli". The MSL patients presents with symmetrical painless swellings made of fat cells distributed over neck, shoulders and upper limbs. The present as "Buffalo hump" or "horse collar". (26) On seeing under the microscope these swellings are made of adipocytes similar to that seen in subcutaneous tissue. But there is loss of architecture and these lobules are larger. These are

not surrounded by capsule or may have thin false capsule. (27) The cause of this disease is not clear. They may be the result of neoplastic growth of brown tissue that are active. (28) These are usually not sensitive to the catecholamine action of lipolysis, thus may recur. It is also associated with mitochondrial respiratory enzyme dysfunction. (29)

They may present with multiple slowly progressive confluent lipomas with average size 1-20cm and around 1000 in number. They cause pressure over vessels and nerves. Sometimes leads to breathlessness because of compression of respiratory tract.

There are two types of MSL: (30)

1. Type I: involves upper part of the body.
2. Type II: generalised distribution

The differential diagnosis of MSL are:

1.obesity,

2.familial multiple lipomatosis

3.adiposis dolorosa (Dercum's disease)

4. lymphoproliferative diseases,

5.lymph node metastases,

6.diseases of the thyroid (goitre, carcinoma, etc.),

7.buffalo neck in Cushing's disease,

8.sialadenitis

9.cervical cysts

10.neurofibromatosis,

11.benign and malignant tumours (angiolipomas, lipoblastomas, sarcomatous processes, etc.).

It is usually treated by conventional excision, liposuction, or the combination of both. The procedures cannot be aimed at removing the tumours completely since there is absence of capsule and there is large area of distribution. It may also lead to metabolic alterations. The

recurrent lipomas are difficult to remove due to its fibrosis. Post operatively the patient should wear compression bandage for 1-3 weeks. (31)

LIPOSUCTION

HISTORY

It all began in 1920s when a French surgeon, Charles Dujarrier attempted liposuction in a ballet dancer aimed at removing fat from lower limb with the help of intrauterine curette. But the results failed. Later in 1960s the surgeons tried various methods to remove fat below the skin. (32)

The two surgeons named Arpad and Giorgio Fischer worked on the modern technologies of liposuction (33,34) The suction of fat was tried with a blunt cannula. Some cannula had an added property of cutting the tissue. The results of using the new instruments was published in 1976. (35)

The cross-tunnelling technique of removing fat through many entry sites was introduced by Fischers. Illouz hailing from Paris propagated the “wet technique” to remove fat. The combination of hypotonic saline and hyaluronidase was injected into the adipose tissue before suctioning it out. This helped in achieving haemostasis and causes less trauma. In a dermatologic surgeon noticed the usage of Fischers’ machine. (36)

The American Society of Plastic and Reconstructive Surgery took up a task in 1982 in Paris to look into the technique and learn from Fournier and Illouz. Americans Julius Newman and Richard Dolsky started the first course on liposuction in America in Philadelphia in 1982. Subsequently other courses were conduction. In 1984 the residency programs on liposuction was started. In1987 liposuction was added to that main curriculum. The American Society for Dermatologic Surgery, the American Academy of Dermatology, and the International Society of Dermatologic Surgery have been working on liposuction since 1984. They have published many articles on liposuction in their journals. American Academy of Dermatology published

guidelines for liposuction in 1991. The addition to these guidelines were published in Dermatologic surgery in 2000. (37)

Many textbooks have also been published. Narins's published book titled Safe liposuction and fat transfer which was collectively written by 32 authors. (38) Klein also had published a book on tumescent anaesthesia and microcannula for liposuction. (39)

The significant developments are made in liposuction technique based on the cannula structure. There are blunt tip cannulas that was designed which caused less bleeding and damage to nerves. But subsequently the discovery of even smaller cannulas was made that resulted in less trauma. The use of small cannulas also had advantage of resulting in less pain. (39)

The type of cannula to be used is a surgeon's preference. Some surgeons go for aggressive and an open design with an aim to suck large amount of fat. Some prefer smaller cannulas to attain finesse even if it is time consuming.

The most significant development in modern liposuction is the tumescent anaesthesia. (40) Klein has played a major role in revolutionising the liposuction in 1987 by working on tumescent anaesthesia. (41) The diluted lidocaine with epinephrine is used to control bleeding. (42) The usage of this fluid resulted in lesser incidence of seroma and hematoma formation. It also has an advantage of not requiring general anaesthesia.

In early 1990s there was the invention of ultrasonic liposuction by Zooch. (43) This was adopted but eventually it was realised the using an internal source of ultrasound i.e. the cannula tip with ultrasound caused more harm by burning the skin and causing seroma. The usage of external source of ultrasound made no difference (44,45,46)

The discovery of power assisted liposuction has eased the surgeons work since it mimics the to and for action of removing fat and helpful in difficult areas with dense fibrous tissue like in gynecomastia. (47,48)

The usage of liposuction has been expanding for various indications. It has been used for breast size reduction but its usage to alter the shape and position is not proved. It is also used in lipoma, lymphatic surgeries.

The laser combination with liposuction is under the development. The use of lasers combined with liposuction is currently being studied. The discoveries and innovations with instruments and procedures will continue over the time.

DRY LIPOSUCTION

Was first done using uterine curettes. It resulted in various complications like lymphorrhea, uneven contours and the cavity remined after drainage. Fischer and Fischer, in 1977 added suction to the curette. (49) It was seen that if large volume of fat is extracted it resulted in bleeding during the surgery and oedema after the surgery. Hence the major concern for liposuction is lymphatic systems. Then came the evolution of 4-mm cannula for suction. Lymphatics are less affected in case of longitudinal tension rather than transverse approach.

TUMESCENT LIPOSUCTION

Illouz extracted fat using a better version of suction assisted lipectomy. He used a normal saline that leads to adipose cells swelling and resulting in rupture. This whole procedure is done under the local anaesthesia. This avoided the risks and complications of general anaesthesia and resulted in less pain. There is better haemostasis achieved as well

A study was made to know the effect of tumescent anaesthesia on the lymphatic channels There is less damage to the epifascial lymph vessels. The subcutaneous connective tissue acts as a protective layer for the lymphatics. This framework is maintained by the tumescent technique (50)

LOCAL TUMESCENT ANESTHESIA

The tumescent anaesthesia is a combination of diluted solution of normal saline with lidocaine with epinephrine. This is aspirated before doing the liposuction. This is a good method to achieve haemostasis by causing vasoconstriction and decreases the need for general anaesthesia. This can be used safely on put patient basis and aid in better healing. The delayed absorption of lignocaine causes lesser need of post-operative analgesics since the action lasts upto 18 hours. (51) It also may have an advantage of having antibacterial action of lidocaine but it is not proven. (52,53)

The lidocaine blocks the sodium ion movement through the nerve membrane thus causing slow rate of depolarization. The impulses are not propagated. The lidocaine has an aromatic structure that has a lipophilic property and thus aids in causing dissolution of subcutaneous fat.

There is also delay in systemic absorption of the lidocaine. The tumescent fluid will be left behind between the septae which can be aspirated later. The infiltrated fluid act as a cushion and compresses the vessels thus slows the absorption. (54)

The anaesthesia combination will act within 15-30 mins of infiltration. The lidocaine gets eliminated in 48 hours and after 12 hours of infusion it has its peak concentration in the plasma. The action of lidocaine can be buffered with sodium bicarbonate to make the solution less acidic and thus causing less pain

Epinephrine is an adrenergic agent. It plays a role in achieving haemostasis and also prevents rapid systemic absorption of the lidocaine. A dose of 0.5-1 mg/l (1:2000000 – 1: 100000) will give effective action and does not cause tachycardia. Patients with cardiac or thyroid diseases need lesser concentration of the epinephrine.

Klein plays an important role in discovering the local tumescent anaesthesia.

1. For general anesthesia:

(a) Normal saline: 1,000 ml

b) Epinephrine: 1 mg

2. For local tumescent anesthesia:

(a) Normal saline: 1,000 ml

(b) Epinephrine: 1 mg

(c) Lidocaine: 1,000 mg

The maximum safe dose of the anaesthesia that can be used is 35mg/kg

The solution utilized in 1990's consisted of:

1. Normal saline: 1,000 ml

2. Epinephrine: 1 mg

3. Lidocaine: 500 mg

4. Sodium bicarbonate: 12.5 mEq

Klein, in 1993, changed the local tumescent anesthesia solution to (55):

1. Normal saline: 1,000 ml

2. Epinephrine: 0.5–0.75 mg

3. Lidocaine: 500–1,000 mg

4. Sodium bicarbonate: 10 mEq

5. Triamcinolone: 10 mg (optional)

In 2000, Klein described the combination for tumescent anaesthesia and corelated with the amount of fat to be removed (39)

1. Normal saline: 1,000 ml

2. Lidocaine: 500 mg

3. Epinephrine: 0.5 mg

4. Sodium bicarbonate: 19 mEq

The tumescent technique helps in minimising the blood loss thus causing less bruises and causes less pain post operatively.

The typical combination is 0.005%- 0.1% lidocaine of 1000 mg dose, 10 mEq sodium bicarbonate and 1:1,000,000–1:2,000,000 epinephrine in 1 litre of normal saline Solution. The concentration and the quantity vary with the area of liposuction

LIPOSUCTION CANNULA DESIGNS:

The past two decades have been very important for the transformations of the liposuction surgeries. In 1980s they used to use large diameter cannulas. But it was noticed that the areas with limited working space like neck could not be reached with such large diameter and caused more pain and less accuracy in complete removal of fat.

As and when there were evolutions in respect to anaesthesia there were also transformation of the cannulas side by side. The diameter of the cannulas was diminishing over the years. The larger the cannula the quantity of fat removed were more but it led to problems like irregularities in skin and causing bad cosmesis. These cosmetic issues were combatted by the use of smaller sized cannula. The larger diameter cannula caused excess damage to the tissue and resulted in more pain and led to excess bruises over the skin. The smaller cannula caused less damage to neurovascular bundle and this caused less pain.

Tumescent anaesthesia does not cause complete relief of pain like that of general anaesthesia. Thus, by using small diameter cannula or blunt end cannula the pain perceived will be less. The length of the cannula will be proportionately decreased as the diameter is reduced. This is done to avoid the bending of the shaft. The small sized cannula results in need for small incisions and thus small scars.

There are many types of cannula based on the handle design, the shaft, the tip or composition. The volume of fat to be removed and the operation room setting also helps in determining the

cannula needed. If there is less time to operate, large aggressive cannulas are used. So ultimately it is the surgeon who decides on the cannula type.

The cannula that has aperture on the rounded shaft will remove fat efficiently. Whereas those cannula with flat shaft will have difficulty in removing large sized fat cell. Thus, flat cannulas are used when small quantity of fat has to be removed. More the number of apertures more fat can be removed. (56)

The various types of cannula are:

1.Cannula handles:

-Round

-Round with a thumb indent

-Octagonal

-Grip

-Universal (one handle accepts different shafts)

2.Cannula shafts

-Straight

-Angled

-Short, medium and long lengths

3.Cannula tips

-Round (aperture located caudal to the tip)

-Tapered (aperture located caudal to the tapered tip)

-Flat (aperture located within the flattened tip)

-Spatula (widened flat tip with the aperture located within the tip)

-Round open (open aperture at the end of the cannula, i.e.no tip present)

-Open end (two oblong-shaped apertures occupying one half of the cannula tube and located immediately posterior to the tip)

-Basket (four apertures located directly at the tip, each separated by 90°)

-Keel or arched (a central arch over two apertures directly opposite each other at tip end)

-Dissecting (flat or notched tip without an aperture in the tip or on the shaft)

4.Cannula apertures

-Single (the aperture is either part of the tip or located posterior to the tip)

-Multiple in-line (two or three apertures in a straight line)

-Offset (two or three apertures offset along one side of the cannula)

-Direct access (the aperture is located at the tip and fat can enter the cannula directly as it is pushed through the fat)

5.Specialized liposuction apparatus

-Custom-made tips

-Custom-made cannulas

6.Disposable cannulas

7.Detachable cannulas (interchangeable with a universal handle)

8.Syringe cannulas

The tips of the cannula are less aggressive if the opening is away from the tip. The opening at tip will directly attack the fat tissue and also damages the septa. It results in more pain and bleeding.

The way the cannulas are manufactured will have its impact on the way it can be cleaned. (57)

The handles are usually made of stainless steel or titanium or alloys to get enough strength as shown in the FIGURE 10. The lighter the weight of the cannula will cause less fatigue to the surgeon.

FIGURE 10: CANNULA HANDLE TYPES – DETACHABLE AND ATTACHED.

The shafts are made of stainless steel and is of different length. The small ones are used in places that are difficult to approach like that over face, neck or knees. The interchangeable shafts with universal handles are of utmost advantage. The cleaning of the cannula is done using thin stilettles.

The rounded tip is difficult to push through the chunk of adipose tissue. The Figure 11 shows the different types of tips. The tapered tip can cut through the fibrous tissue and tear the vessels. The small- diameter tapered tip causes lesser destruction of septa and vessels.

The Figure 12 shows the different kinds of openings on the cannula. Multiple in line openings is more beneficial in lipomas and gynaecomastia.

FIGURE 11: DIFFERENT CANNULA TIPS

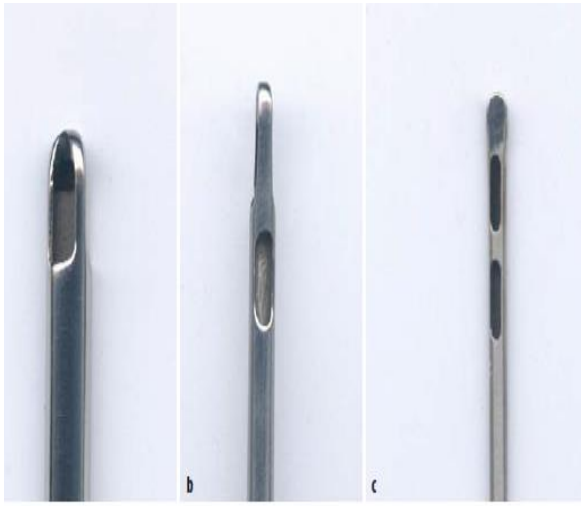


FIGURE 12 : DIFFERENT APPERTURES OF CANNULA

VARIOUS TECHNIQUES FOR LIPOMA EXTRACTION:

These are various techniques implemented to remove lipomas:

Pre-operative steps

These steps mostly remain similar for all the procedures. Using a surgical pen, the outline of the lipoma is marked. The skin is cleaned with betadine or any alcohol based disinfectant and appropriate anesthesia (local / regional / tumescent anesthesia) is infiltrated. The operative area is draped. (16)

1.INCISION AND PRESSURE METHOD

An incision of about one third or half the diameter of lipoma is made over the skin using 15 no blade. Metzenbaum scissors are used to break the fibrous bands around the lipoma and spread circumferentially. Once its separated, the pressure is applied with fingers at the edges of the mass and the lipoma is pulled out. If required the incision may be increased and traction may be exerted with haemostat. Before suturing the skin with suitable suture material, the haemostasis should be achieved and complete fat tissue removal should be ensured. This method is better suited for removing encapsulated than non -encapsulated one. (16)

2.ELLIPTICAL EXCISION METHOD

In case of giant or lipomas that are complicated, an elliptical incision is made for satisfactory visualization of the operating field. Then the lipoma is removed en-mass or as segments. However this method leaves large scar (16)

3.PUNCH (ENUCLEATION) TECHNIQUE

The skin over the lipoma is made taut by stretching at right angle to skin lines. A 4-6 mm punch biopsy tool is used with downward pressure on the lipoma and rotated , the epidermis

and dermis of the skin is removed .A 3 mm curette is placed through the incision to scrape out the surrounding tissue .The lipoma is extracted through the incision using a haemostat once freed . The curetting may have to be repeated several times. In case of large lipomas, more than one incision is needed and lipoma is removed in segments (16)

ALTERNATE REMOVAL METHODS:

4.ELECTROSURGERY

A high frequency alternating current is made to pass through the lipoma to furnish sufficient heat. These currents may be delivered through monopolar or bipolar form. But this method leads to various problems like interference with pacemakers, produces smoke during the surgery and causes bad scars by burning the surrounding skin. (58)

5.CAUTERIZATION

The heat is used as the source to burn the fat tissue. This is usually not used for removing the subcutaneous lipomas. Several unique heat furnishing instruments are used.

6. HARMONIC SCALPEL

This is another method wherein heat is used as a source to remove the tissue. The vibrations of 55.5kHz is induced in the scalpel mechanically. These brisk movements generate sufficient heat due to friction. The harmonic scalpel is then used to enable cutting and coagulation of tissues simultaneously. This method needs lesser operative time compared to that of electrocautery. This is usually avoided as it causes burning of skin. (59)

7.LIPOSUCTION

This technique has more importance in cosmetic point of view. The fat in the subcutaneous layer is removed by using micro suction cannula through small cutaneous incision. The incisions can be planned to gain better cosmetic outcomes. In wet liposuction, the loosening of adipose tissue can be achieved by infusing fluid and this also helps in achieving

haemostasis. Other routes of anesthesia to curtail the pain can be given. A cannula is initially used to make tunnels in the adipose tissue . Then the fat can be aspirated by using cannula of increasing diameter. A steady, repetitive, to-and-fro movements of cannula is made to achieve proper aspiration. Initially the deeper layers of fat are targeted followed by the superficial layers. Various techniques of liposuction are being described. (60)

A. CONVENTIONAL LIPOSUCTION TECHNIQUE

Initially large incisions of 1-1.5 cm are made. A large sized cannula of 0.6 to 1cm in diameter are used. The conventional liposuction technique begins by creating relatively large incisions 1–1.5 cm near the target area. A larger cannula 0.6–1 cm in diameter is then initiated into the subcutaneous layer to aspirate the adipose tissue. The suctioning can be undertaken in wet or dry environment. The disadvantages of this method are the need for general anesthesia and creates bigger scar.

B. TUMESCENT LIPOSUCTION TECHNIQUE

Multiple small incisions of 1-3 mm size are made at the target area. Introduction of Klein's fluid is made for the loosening of fat tissue and gaining haemostasis by vasoconstriction action along with the local anesthesia action. Usage of microcannula of size ranging 1.5–3 mm in diameter is practiced. This doesn't require general anesthesia and can be performed under local or regional anesthesia. Hence can be performed on outpatient basis and there is better relief of pain. This method has its drawbacks with regard to prolonged operative time compared to the conventional liposuction and expenses. (9)

C.POWER-ASSISTED LIPOSUCTION (PAL)

Since in conventional liposuction method, the surgeon may develop fatigue by making repetitive to and fro movements of cannula. This disadvantage is tackled by using power-assisted liposuction. A reciprocating cannula, which mimics the to-and-fro motion made by

the surgeon. This also has an advantage in gaining access to regions where there is hindrance of movement for the surgeon. For example, umbilical and waist regions can be approached with ease without the need for extending the incisions. The drawbacks are the need for general anaesthesia and large cannulas. (9)

FIGURE 13: POWER ASSISTED LIPOSUCTION APPARATUS

D.ULTRASOUND-ASSISTED LIPOSUCTION

The ultrasound waves are used as means to destroy the fat tissue. The probe that emits ultra sound wave is used with the cannula. This causes break down of fat tissue that can be aspirated further. These techniques have major drawbacks of being expensive due to need for special instruments, waves damage the skin, leads to seroma formation and causes oedema after the surgery for a long period (2)

The lipoma is then aspirated using liposuction and the tissue removed through the incision using forceps. Based on the size and site of the tumor the expenses vary. Since it needs proper certification this procedure is usually avoided. (61)

8.LASERS

This method is still under experiment and is more oriented to achieve good cosmetic outcomes. Carbon dioxide (CO_2) lasers help in destroying the tissues. (62)

The water molecules get excited by infrared beam in the lipoma and this emits heat in adipose tissue. Based on the power supplied. This heat destroys the tissue by causing either vaporization of the tissue or melts the tissue. Power of range 3-8 W is used to achieve sufficient heat. (63)

In order to avoid injury to the surrounding structures the energy should to targeted with high accuracy and precision. The lipomas in sensitive areas like spinal cord can be targeted by this method. When we are aiming for complete removal of lipoma this method can be employed. Also plays a role in malignancy.

The usage of lasers to remove lipoma is rare because of small area of exposure of beams. Since the design is complicated and cumbersome, usage of this in small incision is difficult and it causes damage to the adjacent normal skin. Because of the damage to the adjacent skin due to heat, the approximation becomes difficult. This method cannot be used solitarily to remove lipomas and needs to be combined with other procedures.

Omniguide laser systems uses fibre optics that emit CO_2 laser through the flexible tube. In this study, eight patients with lumbar region lipomas were included. Power of 4-8W is used to vaporize the tissue. The tissue is cut 2–4 mm from the tip of the laser. The procedure was successful in all patients without any neural damage. (64)

A study conducted by Alberto Goldman shows the usage of 1064-nm Nd: YAG laser for subdermal lipoma removal as an minimally invasive technique. All cases in the study were treated successfully, but in 4 patients there was recurrence which was further corrected by

applying the same modality of treatment. Its seen that this method is effective but the effectiveness can be increased further by combining it with other modalities like liposuction of the remaining cell debris. (65)

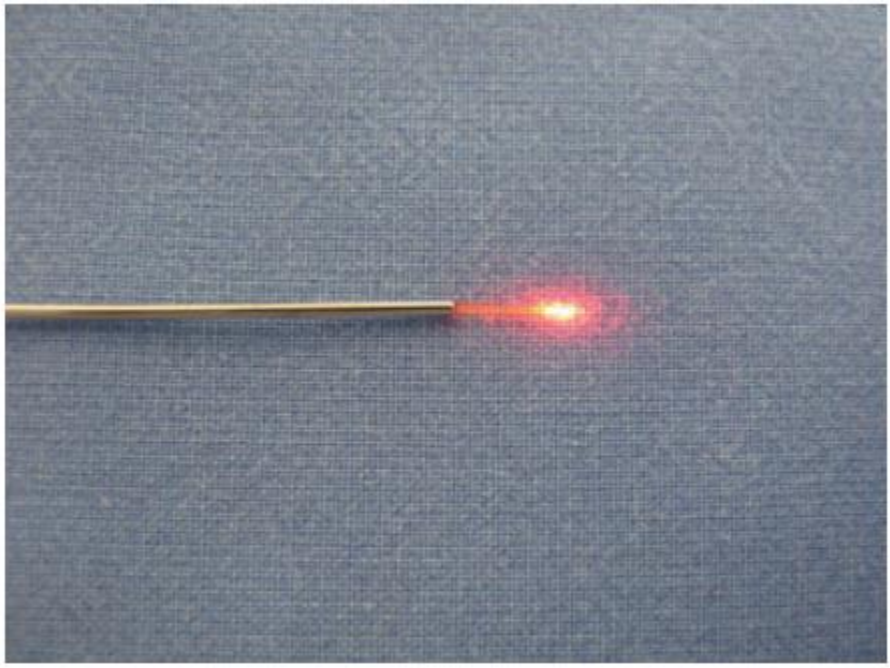
The pulsed 1064-nm Nd: YAG laser has two way of manifesting its action:

1. Thermal effect
2. Optomechanical effect

There is coagulation of the small vessels and reticular dermis. New collagen fibres are formed in the subcutaneous and dermal layer. Apart from acting on the fat tissue it causes destruction of the capsule as well.

A 1 mm incision is made and the cannula with optic fibre is inserted through it. A 300-micrometer fibreoptic with a 1-mm-diameter microcannula of variable length connected to the tip of the fibre is used usually (Fig. 14). In case of larger sized lipoma bigger diameter cannula and 600 micrometre fibreoptic is used. The power is ranged from 4-10 W depending on the site, dimensions and consistency of the lipoma. The fibreoptic is extended 2mm beyond the cannula and to witness the level and location of laser action in subcutaneous plane He: Ne laser source is added to the beam to achieve red light. This diminishes the side effects of skin burns. The intensity of red light is directly indicating that more superficial fat tissues are getting destroyed. In case of lipomas of 5 cm or larger diameter. The lasers are applied in layered manner: subdermal, deep and medium. Later the area is cooled to reduce the oedema formation and burning effect. The remaining tissue is further aspirated with liposuction.

FIGURE 14: CANNULA CONTAINING LASER FIBREOPTIC.



EXPERIMENTAL STUDIES:

9.NON-INVASIVE ULTRASOUND

Apart from using ultrasound for imaging, it plays a role in generating heat by emitting high frequency waves. A High-Intensity Focused Ultrasound (HIFU) is used to focus the waves at a specific point without hampering the intervening tissue. The tissue is destroyed by coagulative necrosis due to the rise in temperature above 80-degree celecius.

A study conducted by Shemer et al. used HIFU to treat lipomas in 9 patients having 12 lipomas. These patients underwent four HIFU treatment in due course of three weeks There were no significant adverse effects determined throughout the study. The size was reduced to average of 58.1 ± 22.8%. (66)

There is a specially designed HIFU system which has been approved by FDA named the Ultra Shape Contour I system which is used to mechanically destroy the fat cells leading to abdominal circumference reduction. But usage of this system is not approved for the removal of lipoma. It needs further research to determine its effectiveness in lipoma removal and to get the approval. (67)

10.NON SURGICAL CHEMICAL AGENTS:

None of the injectable drugs have been approved by FDA for lipoma removal.

The combination of Phosphatidyl Choline (PDC) coupled with Deoxycholate (DC)as an injectable has played a successful role in reduction of lipoma size. The use of steroids, collagenase containing formulations and statin have been experimented in lipoma reduction. (68)

A. STEROIDS

Aiming to decrease the size of lipoma, the usage of corticosteroid with a β2 agonist and triamcinolone acetonide have been tried experimentally.

A study conducted by Salam recommended the usage of a one-to-one mixture of 1% lidocaine and triamcinolone acetonide (10 mg/mL) as an injectable administered on monthly basis. (69)

An attempt was made to trigger the lysis of the fat tissue by using the β2 agonist isoproterenol in combination with prednisolone. The β-adrenergic has its role in local lipolysis and decreases the overall systemic toxicity. The stimulation of β-adrenergic down-regulates β2-receptor which leads to a slight reduction in the efficacy of the injected agonist. The release of the glycerol is reduced by the stimulated β2-adrenergic receptor which aids in lipolysis. The down regulation of the receptors is dealt by administering corticosteroids which play its role in increasing the numbers of the β2-adrenergic receptors. (70)

The results of this study showed that there is better lipolysis when isoproterenol was combined with prednisolone than being used alone. The size was halved by using isoproterenol in concentration of 10^{-6} M.

The recurrence was not seen in one lipoma in which the treatment was done but most of the subjects underwent surgical procedure for the removal.

B. PHOSPHATIDYL CHOLINE/DEOXYCHOLATE

The PDC is a cell membrane component that is combined with DC to administer to lipoma aiming to reduce the quantity of fat tissue which ultimately would give a better cosmetic result. This is used in combination in order to make the formulation soluble; but few studies have proven the only the DC contributes for most of the reduction of the size. The study done by Rotunda et al. concluded that combination of DC leads to better reduction of size compared to that of using DC alone. Thus, it proves that both these agents have its role in destroying the adipose tissue. Many other studies also support this hypothesis of using the combination of the agents. (71)

The DC does not have its action selectively on the adipose tissues. It also destroys the underlying muscles. Hence it has to be used so accurately that it has to target only the adipose tissues. The combined PDC/DC has its own drawbacks of causing bruises, oedema and itching. This combination also hardens the fibrous capsule surrounding the lipoma that makes it difficult for surgeon to excise it if the lipoma recurs.

C.COLLAGENASES

The usage of injectable containing collagenase is under the phase 2 clinical trials. These trials are being conducted by Bio Specifics Technologies Corporation aiming to remove the lipoma. The Collagenase Clostridium Histolyticum (CCH) is the drug of choice in this method. In this trial 14 patients are being used and they are administered with 4 doses and

series of measurements of surface area is done subsequently up to 6 months to know the drug efficacy. The results concluded that there was an average of 67% reduction in size on using 75 % commercial dose, which was the highest dose used in the study. Bruises, swelling, and pain at the injection site are some of the side effects of this. (72)

11.MICROWAVE ABLATION

A specially designed antenna which emits singular frequency and distribution pattern are used to target and destroy the fat tissues. These antennae are insulated everywhere except at the portion that transmits the wave of energy. The heat generated will destroy the tissue. There is deficit in the literature regarding the usage of microwave for lipoma removal. But there are studies that have proposed that the microwave radiations soften the adipose tissue, which can be used prior to the liposuction. This has a risk of destroying the surrounding tissue due to raised temperature. Thus, the temperature should not be above 50°C for duration of 10-60 minutes. The study conducted by Rosen et al. used microwaves to destroy fat tissue in pigs *in vivo* with an antenna/cannula probe of 30–40 W power. This was followed by liposuction. The aspirated material in the suction was creamier, better liquified and contained less blood compared to that of non- microwave- assisted liposuction. It was also noticed that the fibrous septa were also destroyed in this process. (73)

11.COMBINED TECHNIQUES:

In order to discover new approaches for lipoma removal, the above-mentioned procedures are used as a combination.

A. LIPOSUCTION AIDED BY MICROWAVE

Coupling of microwave generator to distal end of electromagnetic transmission line was Rosen and Rosen the fat tissue receives the radiations emitted by the transmission line adjacent to the distal suction port of the suction lumen. The tissue gets softened by the heat . Another manifestation of the invention is that the transmission line is formed in such a way that the electromagnetic field extends to the suction lumen which causes softening of the tissue due to heat through the cannula. In order to improve the coupling of energy between the electromagnetic radiation and the tissue, the normal saline solution or any fluid that has polar molecules are used as injections. This solution may be sucked out later. An external radiator can also be used to generate microwave. This method also has an advantage of causing less infection due to the sterilization caused by the heat generated. (74)

B. LASER-ASSISTED LIPOSUCTION METHOD AND APPARATUS

The liposuction cannula has a water source, laser source and a source for suction. The water is released into the cannula and laser energy is directed to the water molecule. This causes heating of the water molecule due to friction. These heated molecules move to the surrounding fat tissue through the cannula. The fatty tissue is liquified by the heated water which is aspirated by the cannula. (75)

C.FREEZING METHOD FOR CONTROLLED REMOVAL OF FATTY TISSUE BY LIPOSUCTION

This is a combination of cryosurgery with liposuction. First the cryosurgery is applied to the tissue which destroys the fatty tissue by freezing in controlled manner. The tissue is destroyed that aid in removal of fatty tissue. Then the liposuction is applied to remove the remaining tissues. (76)

D.LIPOSUCTION PROCEDURE WITH ULTRASONIC PROBE

This method was proposed by Massengill and Parisi. The ultrasonic vibrations of high frequencies are used and has low amplitude to create a localized tissue separation. The friction generates heat. The probe resembles the cannula which is made adaptable to provide the flow of the fluid for irrigation in a localized manner. The already melted and separated fat gets emulsified. (75)

12. ENDOSCOPIC REMOVAL OF LIPOMA

Sakai et all did a study on usage of endoscope to eliminate large lipomas. The liposuction technique has its limitation of being a blind procedure. Thus, this study showed the usage of endoscope to view the lipoma. A rigid endoscope which is around 4 mm in size is used. The sleeve is used along with the endoscope to view the lipoma by pulling the skin and the subcutaneous tissue away. Through the same incision the procedure is carried out through elevators to dissect the lipoma. The anterior part is approached first, followed by the posterior one. The entire procedure is visualized on the monitor. The usage of this can be combined with liposuction as well. (FIGURE 15,16)

FIGURE 15: 4MM RIGID ENDOSCOPE WITH 30- DEGREE ANGLE LENS WITH SLEEVE ATTACHED.

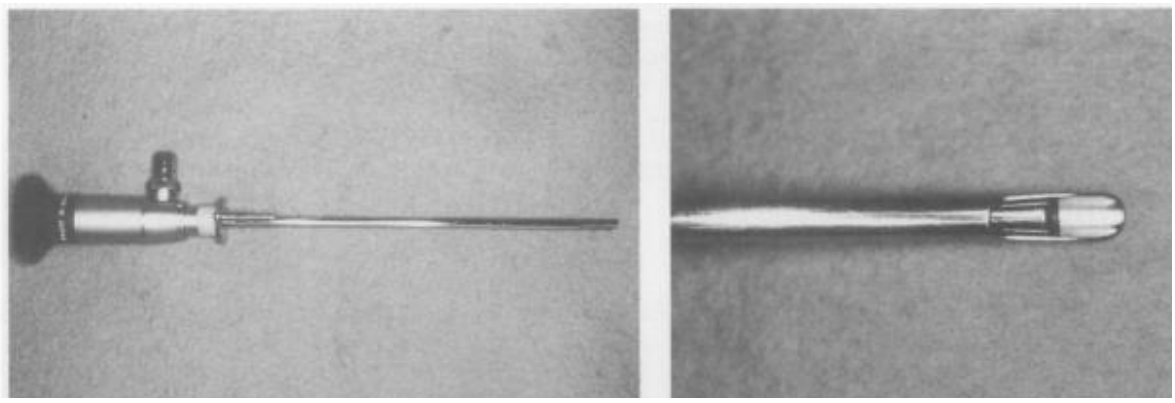
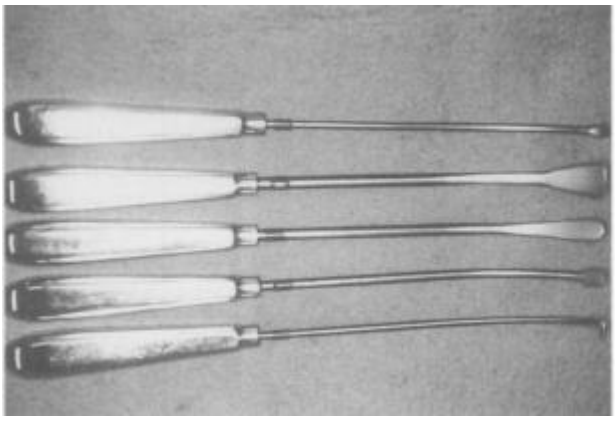


FIGURE 16: ELEVATORS USED FOR DISSECTION



LIPOSUCTION FOR LIPOMA

They are usually indicated for cosmetic purpose. The use of liposuction for lipoma was described by Rubenstein et al. in 1985 The advantages of liposuction is not only in cosmetic point of view for causing small scar but also causes less pain and needs less operative time. The post-operative pain is less compared to the open technique. The multiple lipomas are removed at once. It's usually preferred in case of lipomas more than 4 cm in size. (78) Wilhelmi et al presented 5 cases of less than 4 cm which were removed by liposuction method. The cases were followed up to 10 years and no recurrences were reported. (79)

Apart from using liposuction for lipoma and other cosmetic purposes, it plays its role in other indications like benign symmetric lipomatosis, flap undermining, flap defatting, gynecomastia, pseudo gynecomastia, breast reduction, buffalo hump, hypertrophic insulin lipodystrophy, lymphedema and axillary hyperhidrosis. Other uses remain to be discovered. (80)

The liposuction for lipoma causes small scar, needs lesser time to operative and has less pain post- operatively. It also helps in removing many lipomas through same incision.

The study by John Stuart Mancoll used cannula of size 4-8 mm cannula with diluted lidocaine solution infiltrated into the mass to achieve haemostasis. After the procedure there is no much deformity in the contour and is self-resolved. The reason behind this is that the lipoma has mass effect. After removing the tumour, the native fat cells tend to return to the original position. This is followed by applying compressive dressing. (10)

The procedure of using liposuction alone in order to remove lipoma has disadvantage of leaving the capsule behind. This is due to the limited vision to work and the capsule cannot to be extracted by suction. Hence liposuction can be combined with excision. The study was conducted by Libby R Copeland, Vincenza Pimpinella and Michelle Copeland on combining the liposuction with excision in 25 patients with 48 lipomas in Inova Fairfax Hospital and two other Hospitals in New York, USA from 2003-2012. These patients were followed up for both short term and long-term complications and there were no significant complications or recurrences because they could achieve capsule extraction through same incision. Thus, they concluded that the liposuction with excision of lipoma through same incision is a safe substitute to treat lipoma and also has cosmetic significance. (5)

There is a risk of disseminating the malignant cell due to destruction of capsule when the tumour undergoes combined liposuction with excision. But it is seen that liposarcoma is seen only 20% cases and its incidence is low of about 2.5 cases per million per year. Hence before

the lipoma undergoes liposuction it should be confirmed that it is devoid of any malignant features clinically with supporting biopsy report. FDA has approved that liposuction is the most effective way to remove lipoma. The various techniques and procedures for lipoma was reviewed by Matthew Boyer, Stephen Monette and others conducted in University of Wisconsin-Madison USA. (2)

The study conducted by Franco Bassetto, MD, * Carlotta Scarpa, MD, Þ Fabio De Stefano, MD, þ and Luca Busetto, MDþ on surgical treatment for multiple lipomatosis using the ultrasound guided liposuction in University of Padova, Italy in 13 patients, published in 2013 and concluded that with the guidance of ultrasound better results can be attained. (81)

Igor Peev, Liljana Spasevska, Elizabeta Mirchevska and Smilja Tudzarova-Gjorgova conducted a study on liposuction assisted lipoma removal which was published in 2017. This study was conducted at University Clinic for Plastic and Reconstructive Surgery, Ss Cyril and Methodius University of Skopje. 22 patients with 23 lipomas underwent liposuction and were followed up to one year. The modified Klein solution was used to create super wet tumescent anaesthesia and patient underwent liposuction and through the same incision long forceps was used to remove remaining tissue. They noticed oedema, ecchymosis in the early post-operative period. And there was no recurrence. There were no hematoma or infections. (82)

J. A. Pereira and F. Schonauer did a study on lipoma extraction via small remote incision in 5 patients for 12months in The Queen Victoria Hospital, UK published in 2001. They used gynaecological polyp forceps to bring out lipoma through an incision in remote place and where liposuction cannot be done. Since the forceps has long length and has a grasping end this can be used. The lipoma is pushed using non-dominant hand. It also should advantage of hiding the scar. It gave similar cosmetic results as liposuction. (3)

Raemdonck et al conducted a study for liposuction that included 30 cases and witnessed that the recurrence rate was high. But since all large sized lipomas were included and the study

was done during the time when the technically strong skills didn't prevail, the results cannot be relied upon. (83)

Al-Basty and El-Khatib studied 19 patients from 1995-2001 of multiple and solitary lipoma. The patients underwent liposuction followed by removing the capsule through the same incision using the artery forceps. The patients were followed upto 6 years and no recurrence was seen. (16)

The study conducted by Choi et al studied 21 patients with 31 lipomas who underwent liposuction by using 3mm diameter cannula with 10 ml Luer Lock syringe which helped in creating negative pressure. The liposuction was followed by extracting remaining stroma using haemostat with blunt dissection. 23 cases showed no complications. In three cases the remnant tissue was left behind. The three cases showed bruises that self-resolved. Hematoma and dimpling were few other self-resolving complications noticed. No recurrences were seen in 2 years of the followed-up cases. (84)

There is no study with adequate sample size to know about complication of suction treated lipoma per se. According to Dixit *et al* when liposuction is considered as a technique all complications are minor and usually self-resolving like bruises, hematoma, seroma, infection and dimpling and no major (systemic) complications are usually seen. (85)

5.MATERIALS AND METHODS:

SOURCE OF DATA:

The patients admitted in B.L.D.E.U's Shri. B. M. Patil Medical College, Hospital and Research Centre Vijayapura in the Department of Surgery.

METHOD OF COLLECTION OF DATA:

The patients admitted in B.L.D.E.U's Shri. B. M. Patil Medical College, Hospital and Research Centre Vijayapura in the Department of Surgery during period of **Nov 2017 – May 2019** with a sample size of minimum **46 patients** in each group comprising of a total of minimum **92 patients**.

Details of cases will be recorded including history, clinical examination, and investigations done. Following parameters of each patient/lipoma will be recorded initially at the time of admission and post operatively (after 1week, 3 weeks and 3months)

INITIAL FINDINGS ON ADMISSION

1. Size of subcutaneous lipoma
2. Site of the lipoma
3. Single / multiple
4. Any other associated Co-morbidities

POST- OPERATIVE PARAMETERS:

1. Post-operative Analgesia
2. Post-operative hematoma,
3. Post-operative seroma formation
4. Post-operative infections
5. Post-operative scar and aesthesis
6. Recurrence

INCLUSION CRITERIA

These are the Patients with:

- Lipoma Size – 1cm-10cms
- Age group- 15years to 60 years
- Lipomas in Head, neck, trunk and extremities.

EXCLUSION CRITERIA

These are the Patients with:

- Personal or familial History of Bleeding disorders
- Lipoma in combined forms or complications of lipoma like liposarcoma, angiolipoma, etc.
- Hypertension and diabetes mellitus.

SAMPLING

Prospective, interventional study

A study conducted by Franco Bassetto, MD and others named Surgical Treatment of Multiple Symmetric Lipomatosis with Ultrasound-Assisted Liposuction in University of Padova, Italy published in 2013 was taken as reference study. (81)

- With Anticipated Mean Difference of Efficacy parameter (Proportion of complication) between the two study groups as **5.9** and Anticipated SD as**7.9**, the minimum sample size per group is **46 patients** with **90% power and 5% level of significance**.

  Formula used

- **$n = \frac{(z_\alpha + z_\beta)^2 \, 2 \, SD^2}{MD^2}$**

  Where Z= Z statistic at a level of significance

  MD= Anticipated mean difference

  SD= Anticipated Standard deviation

Total Sample Size: 92

Control: 46

Case Study: 46

PROCEDURE:

Patients who met the inclusion criteria are randomly assigned a control group i.e. those who undergo surgical excision (Group C) or liposuction with excision group (Group L). 46 lipomas will be removed by tumescent liposuction with excision (Group L), while the other 46 lipomas in the control group (Group C) will be treated with conventional surgical excision.

PRE-OPERATIVE STEPS IN BOTH MODALITIES:

The borders of the lipoma are marked with a surgical pen, using palpation to detect the edges. The skin is cleansed with chlorhexidine or alternative disinfectant and local anaesthesia is given using lidocaine with or without epinephrine. Regional or general anaesthesia may be given when it is necessary based on the site of lipoma. The patient is draped to maintain a sterile operating field.

SURGICAL EXCISION:

- A linear incision about 1/3 to 1/2 the diameter of the lipoma, on the skin directly above the lipoma using 15 number scalpel blades.
- The lipomatous tissue is enucleated and removed with dissection scissors and forceps.
- After haemostasis is achieved skin is sutured (simple/ running) with appropriate suture material size (3/0 or 4/0) based on the site of lipoma.

TUMESCENT LIPOSUCTION WITH EXCISION:

- Small incisions of 1–3 cm at key locations are performed in the target area.
- About 2-3ml of Klein's fluid (per ml of fat aspirated), composed of saline, dilute epinephrine and lignocaine, are injected. The saline balloons fat tissue, epinephrine causes vasoconstriction, and lignocaine induces local anaesthesia. Liposuction

solution :1 litre bag of NS solution 50 ml of 1% plain lignocaine 1 ml of epinephrine (1:100,000). (Figure 17)

- A microcannula, typically 2–3 mm in diameter, is introduced to aspirate adipose tissue by to and fro movements and remaining tissue and capsule is extracted through the same incision. (Figure 18)

- The skin is closed with simple sutures with appropriate suture material size(3/0 or 4/0) based on the site of lipoma.

- Elastocompressive bandage will be applied post operatively.

FIGURE 17: TUMESCENT ANAESTHESIA CONTENTS

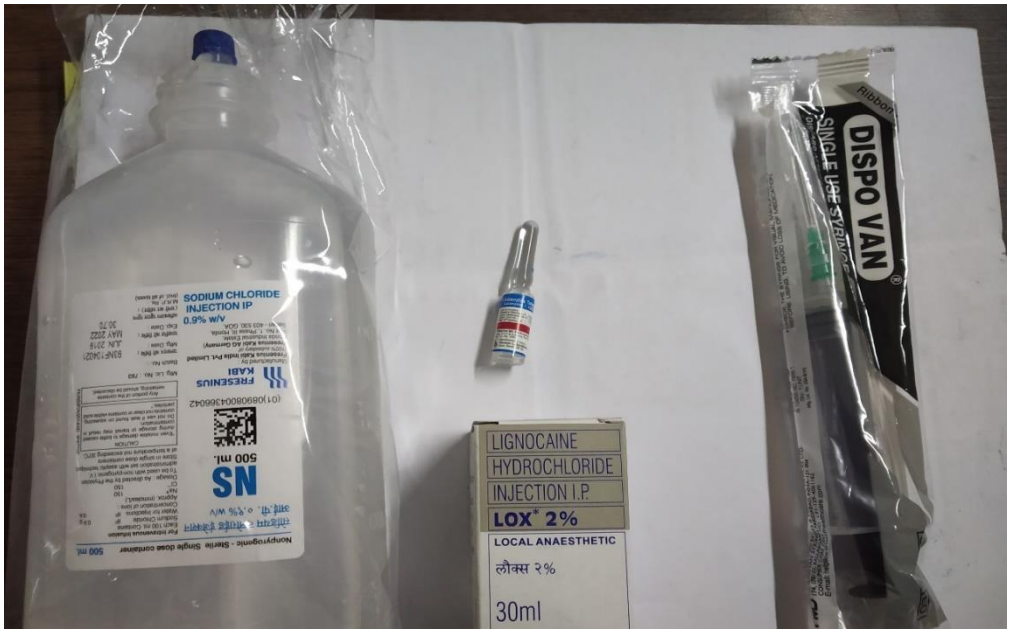


FIGURE 18: PROCEDURE OF LIPOSUCTION WITH EXCISION.





STATISTICAL ANALYSIS

All characteristics were summarized descriptively. For continuous variables, the summary statistics of mean± standard deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries and diagrammatic presentation. Chi-square (χ^2) test was used for association between two categorical variables.

The formula for the chi-square statistic used in the chi square test is:

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

The difference of the means of analysis variables between two independent groups was tested by unpaired t test.

The t statistic to test whether the means are different can be calculated as follows:

$$t = \frac{(\overline{x_1} - \overline{x_2}) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

where $\bar{x}_1$ = mean of sample 1

$\bar{x}_2$ = mean of sample 2

n_1 = number of subjects in sample 1

n_2 = number of subjects in sample 2

s_1^2 = variance of sample 1 = $\frac{\Sigma(x_1 - \bar{x}_1)^2}{n_1}$

s_2^2 = variance of sample 2 = $\frac{\Sigma(x_2 - \bar{x}_2)^2}{n_2}$

If the p-value was < 0.05, then the results were considered to be statistically significant otherwise it was considered as not statistically significant. Data were analysed using SPSS software v.23.0. and Microsoft office 2007.

6.RESULTS:

A total of 92 patients were included in the study and were randomly divided into two groups, 46 patients in LIPOSUTION WITH EXCISION (L) Group and 46 patients in CONVENTIONAL EXCISION (C) Group.

TABLE 1: DISTRIBUTION OF AGE BETWEEN GROUP L AND GROUP C

AGE (YRS)	GROUP L		GROUP C		p value
	N	%	N	%	
≤20	4	8.7%	1	2.2%	0.520
21-30	11	23.9%	14	30.4%	
31-40	11	23.9%	8	17.4%	
41-50	14	30.4%	14	30.4%	
51-60	6	13.0%	9	19.6%	
Total	46	100.0%	46	100.0%	

GRAPH 1: DISTRIBUTION OF AGE BETWEEN GROUP L AND GROUP C

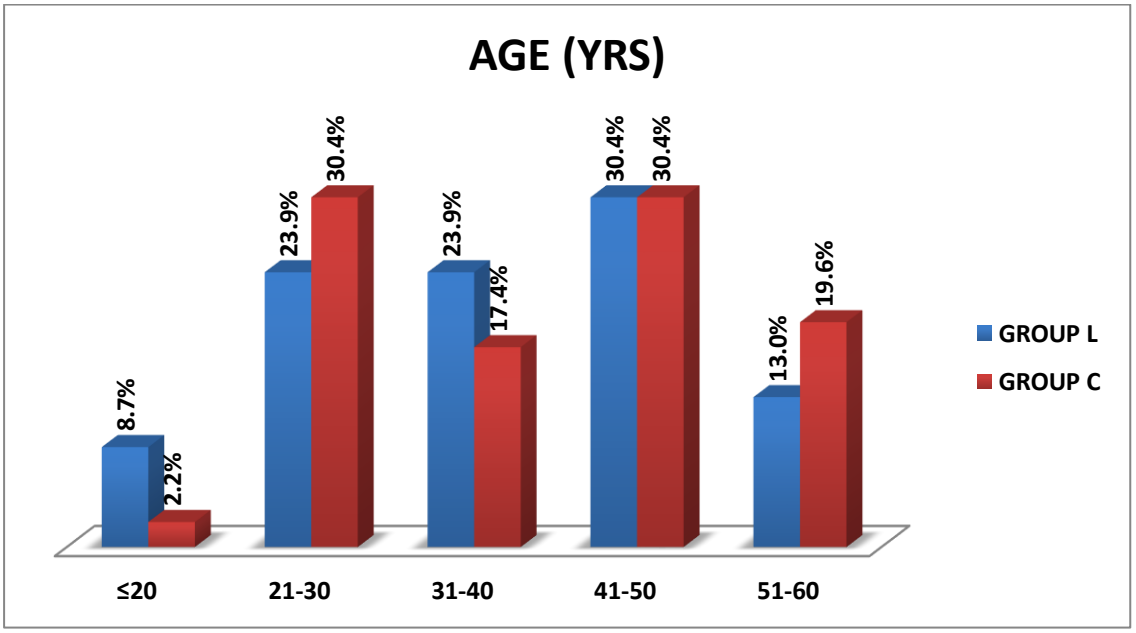
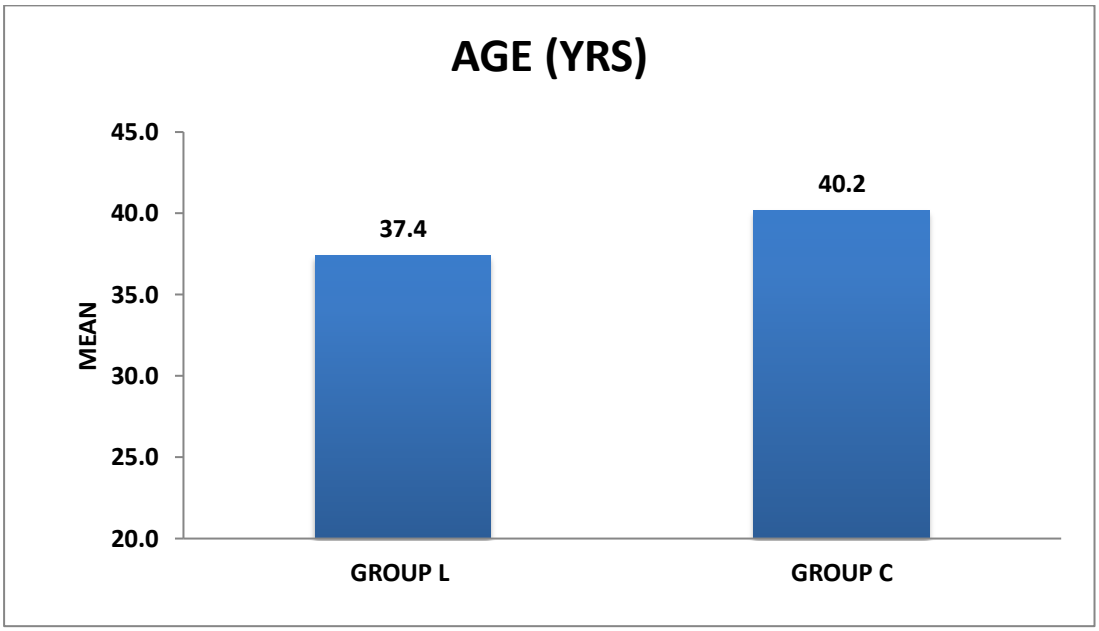


TABLE 2: MEAN AGE BETWEEN GROUP L AND GROUP C

PARAMETERS	GROUP L		GROUP C		p value
	Mean	SD	Mean	SD	
AGE (YRS)	37.4	11.6	40.2	12.6	0.309

GRAPH 2: MEAN AGE BETWEEN GROUP L AND GROUP C

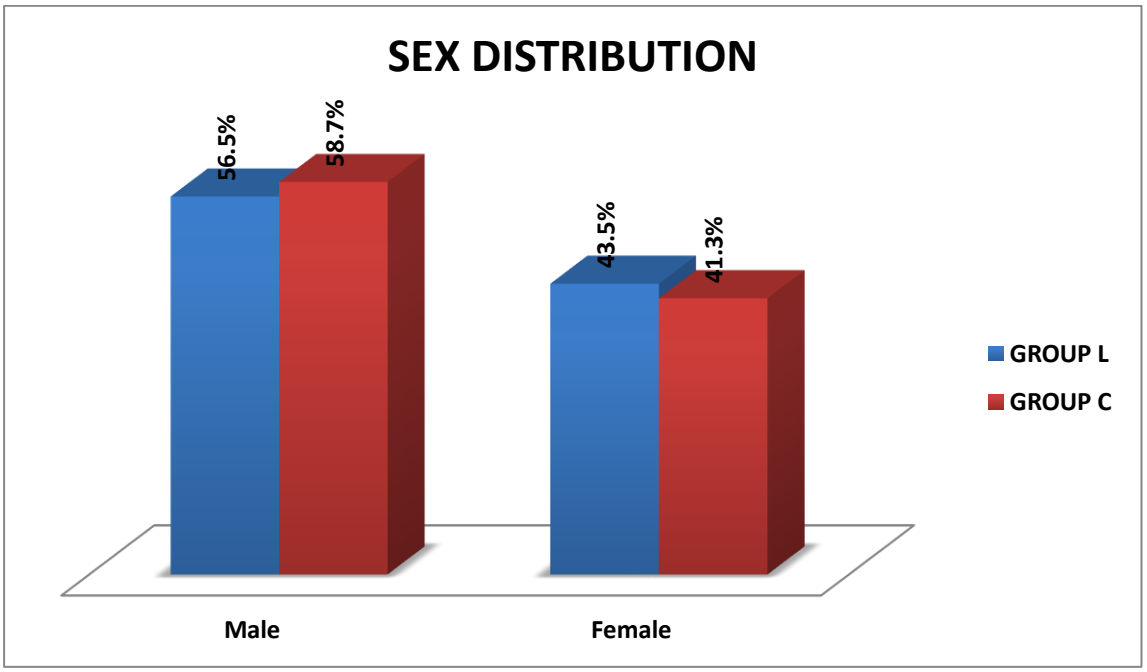


The mean age in group L was 37.4 and in group C was 40.2. The majority of patients in both the groups belonged to age group 21-50years i.e. 36 patients in each group with 14 patients(30.4%) belonging to 41-50 years in each group. (GRAPH 1,2) (TABLE 1,2)

TABLE 3: DISTRIBUTION OF SEX BETWEEN GROUP L AND GROUP C

SEX	GROUP L		GROUP C		p value
	N	%	N	%	
Male	26	56.5%	27	58.7%	0.833
Female	20	43.5%	19	41.3%	
Total	46	100.0%	46	100.0%	

GRAPH 3: DISTRIBUTION OF SEX BETWEEN GROUP L AND GROUP C



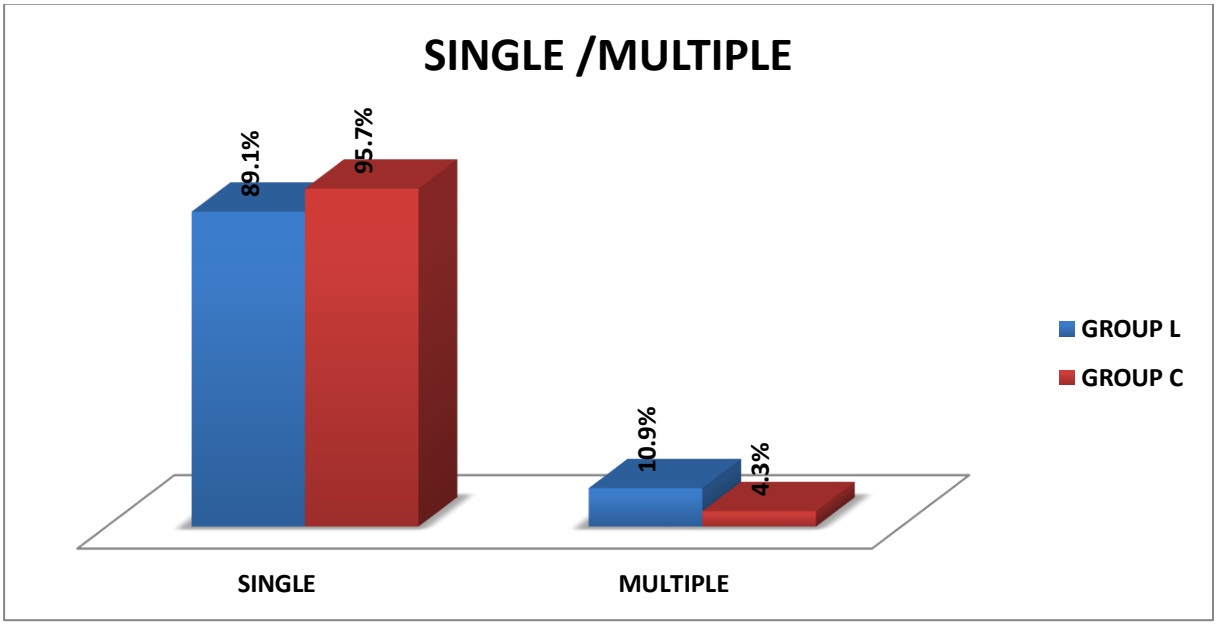
The Liposuction with excision Group had 26 male (56.5%) and 20 female (43.5%) patients as compared to the C group which had 27 male (58.7%) and 19 (41.3%) female patients. When combined both the groups the male to female ratio is 53:39. (GRAPH 3) (TABLE 3) (FIG 19)

FIGURE 19: DISTRIBUTION OF SEX BETWEEN GROUP L AND GROUP C

TABLE 4: DISTRIBUTION OF NUMBER OF LIPOMAS BETWEEN GROUP L AND GROUP C

SINGLE /MULTIPLE	GROUP L		GROUP C		p value
	N	%	N	%	
SINGLE	41	89.1%	44	95.7%	0.238
MULTIPLE	5	10.9%	2	4.3%	
Total	46	100.0%	46	100.0%	

GRAPH 4: DISTRIBUTION OF NUMBER OF LIPOMAS BETWEEN GROUP L AND GROUP C



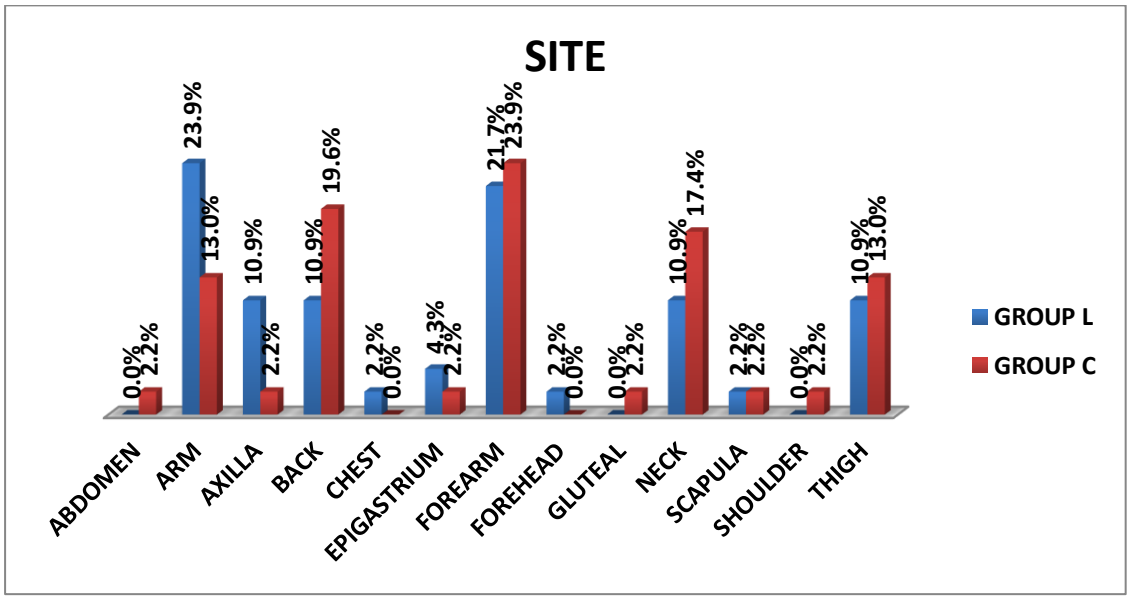
Majority of the patients had only single lipoma 41 (89.1%) patients in L group and 44 (95.7%) patients in C group and 5 patients (10.9 %) in L group and 2 patients (4.3%) (GRAPH 4) (TABLE 4)

FIGURE 20: MULTIPLE LIPOMA UNDERWENT LIPOSUCTION WITH EXCISION

TABLE 5: DISTRIBUTION OF SITE BETWEEN GROUP L AND GROUP C

SITE	GROUP L		GROUP C		p value
	N	%	N	%	
ABDOMEN	0	0.0%	1	2.2%	0.491
ARM	11	23.9%	6	13.0%	
AXILLA	5	10.9%	1	2.2%	
BACK	5	10.9%	9	19.6%	
CHEST	1	2.2%	0	0.0%	
EPIGASTRIUM	2	4.3%	1	2.2%	
FOREARM	10	21.7%	11	23.9%	
FOREHEAD	1	2.2%	0	0.0%	
GLUTEAL	0	0.0%	1	2.2%	
NECK	5	10.9%	8	17.4%	
SCAPULA	1	2.2%	1	2.2%	
SHOULDER	0	0.0%	1	2.2%	
THIGH	5	10.9%	6	13.0%	
Total	46	100.0%	46	100.0%	

GRAPH 5: DISTRIBUTION OF SITE BETWEEN GROUP L AND GROUP C



The lipomas are distributed all over the body. In L group ,11 patients (23.9%) had in arm, 5 patients (10.9%) in axilla, 5 patients in back (10.9%), 1 patient over the chest (2.2%), 2 patients in the epigastrium (4.3%), 10 patients in forearm (21.7%), 1 in forehead (2.2%), 5 in the nape of the neck (10.9%), 1 over the scapula (2.2%) and 5 patients (10.9%) had over the thigh. In C group ,1 patient (2.2%) had in abdomen, 6 patients (13%) in arm , 1 patient (2.2%) in axilla, 9 patients over the back (19.6%) , 1 patient in the epigastrium(2.2%) , 11 patients in forearm (23.9%), 1 in gluteal(2.2%), 8 in the nape of the neck (17.4%), 1 over the scapula and shoulder each (2.2% each) and 6 patients (13%) had over the thigh. (TABLE 5) (GRAPH 5) (Figure 21)

FIGURE 21– DISTRUBUTION OF THE SITES OF LIPOMA

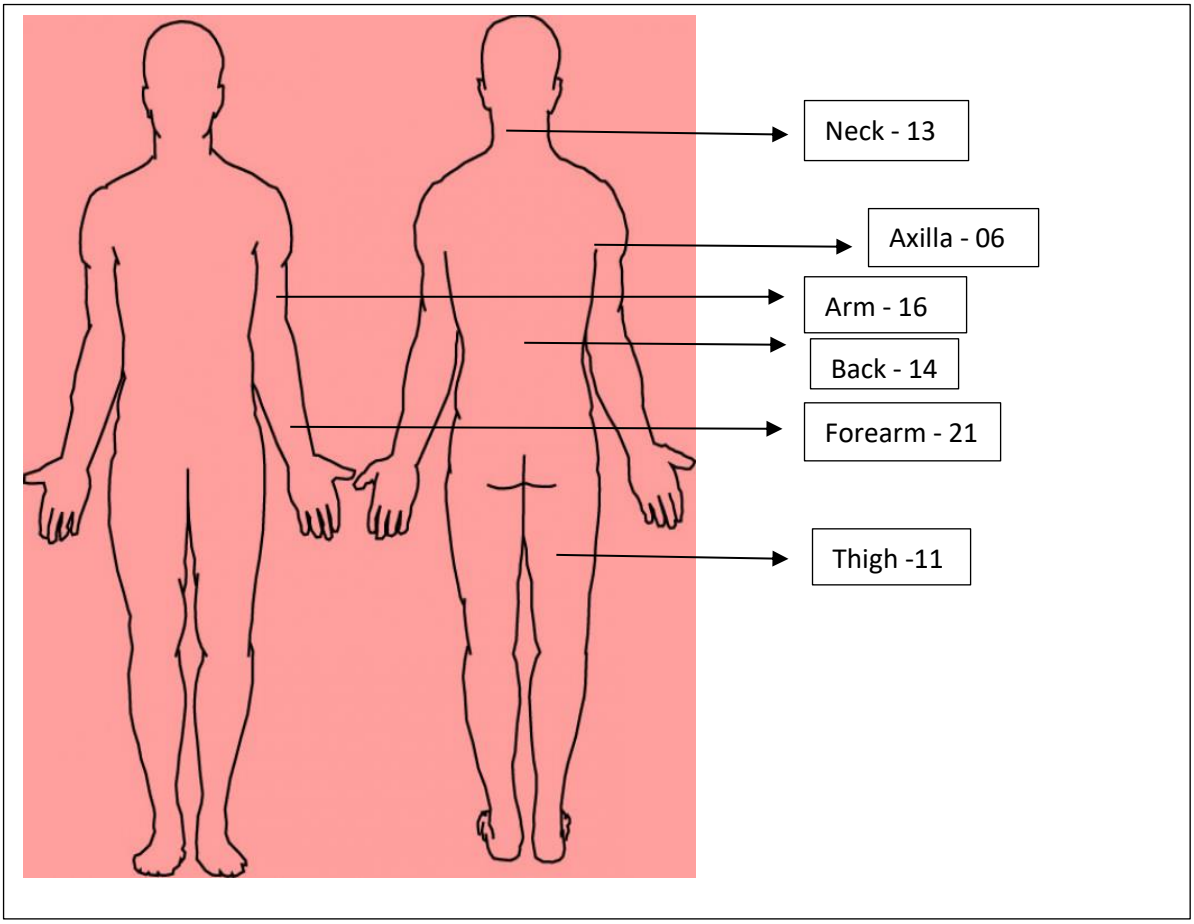


TABLE 6: DISTRIBUTION OF SIZE BETWEEN GROUP L AND GROUP C

DIAMETER (cm)	GROUP L		GROUP C		p value
	N	%	N	%	
2	5	10.9%	1	2.2%	0.606
2.5	1	2.2%	0	0.0%	
3	9	19.6%	12	26.1%	
4	9	19.6%	8	17.4%	
5	7	15.2%	11	23.9%	
6	5	10.9%	4	8.7%	
7	1	2.2%	3	6.5%	
8	4	8.7%	3	6.5%	
9	1	2.2%	0	0.0%	
10	4	8.7%	4	8.7%	
Total	46	100.0%	46	100.0%	

GRAPH 6: DISTRIBUTION OF SIZE BETWEEN GROUP L AND GROUP C

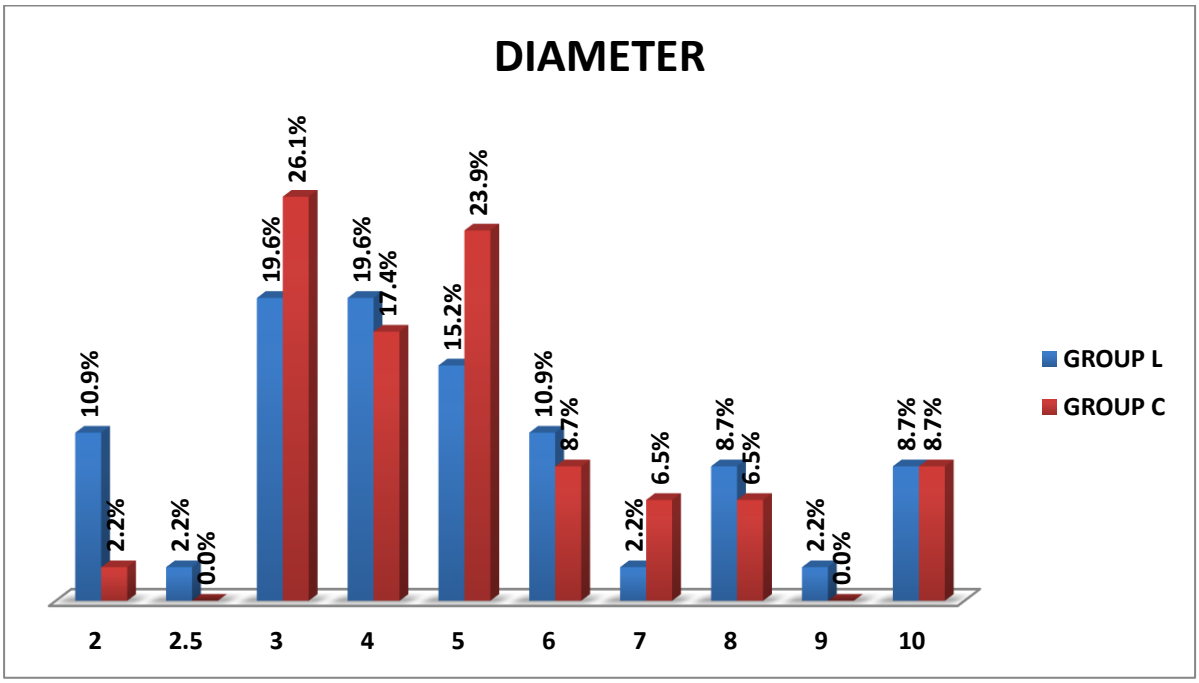
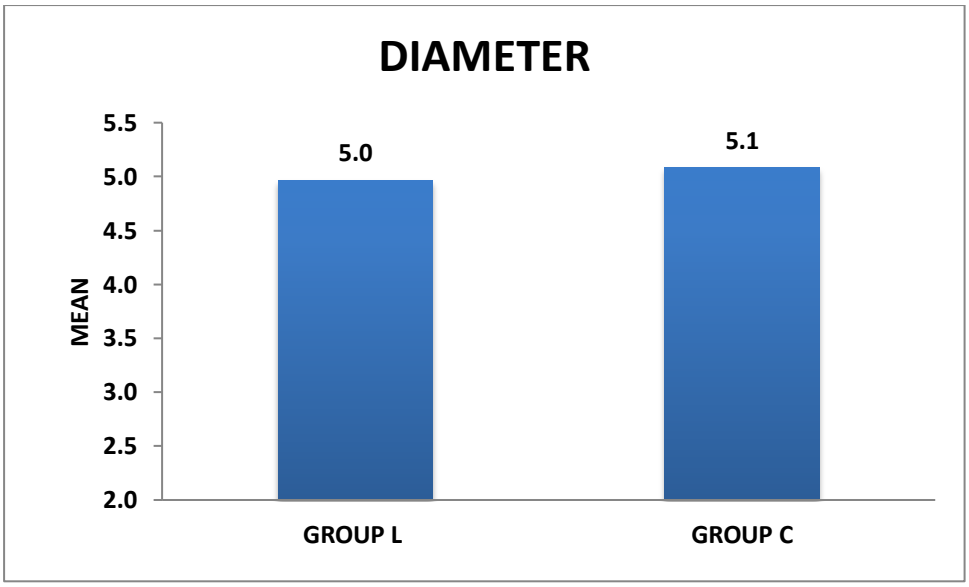


TABLE 7: MEAN DIAMETER BETWEEN GROUP L AND GROUP C

PARAMETERS	GROUP L		GROUP C		p value
	Mean	SD	Mean	SD	
DIAMETER	5.0	2.4	5.1	2.1	0.801

GRAPH 7: MEAN DIAMETER BETWEEN GROUP L AND GROUP C



The diameter of the lipoma varied from 2-10 cm. In L group 5 patients (10.9%) had lipoma of size 2 cm, 1 patient (2.2%) with 2.5 cm, 9 patients (19.6%) of 3 cm and 4 cm each, 7 patients (15.2 %) with 5 cm diameter, 5 patients (10.9%) with 6 cm diameter, 4 patients (8.7%) with 8 and 10cm diameter each, 1 patient (2.2%) with 7 and 9 cm diameter each. In C group, 1 patient (2.2%) had 2 cm diameter, 12 patients (26.1%) had 3 cm diameter lipoma, 8 patients (17.4%) had 4 cm size, 11 patients (23. %) had 5 cm diameter, 4 patients (8.7 %) had 6 cm sized, 3 patients (6.5%) of 7 and 8 cm diameter each, 4 patients (8.7 %) was sized 10 cm. Over all the mean size of the lipoma in L group is 5.0 cm and in C group 5.1 cm. (TABLE 6,7) (GRAPH 6,7)

TABLE 8: DISTRIBUTION OF PAIN SCORE BETWEEN GROUP L AND GROUP C

PAIN SCORE	GROUP L		GROUP C		p value
	N	%	N	%	
2	12	26.1%	0	0.0%	<0.001*
3	14	30.4%	5	10.9%	
4	17	37.0%	21	45.7%	
5	3	6.5%	20	43.5%	
Total	46	100.0%	46	100.0%	

Note: * significant at 5% level of significance (p<0.05)

GRAPH 8: DISTRIBUTION OF PAIN SCORE BETWEEN GROUP L AND GROUP C

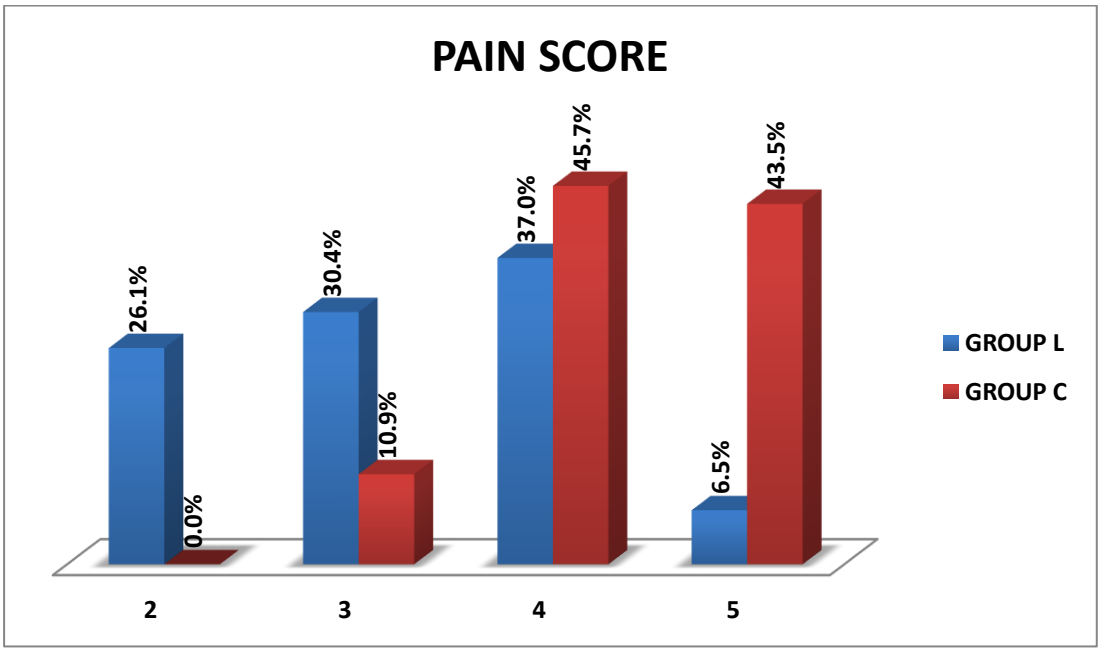
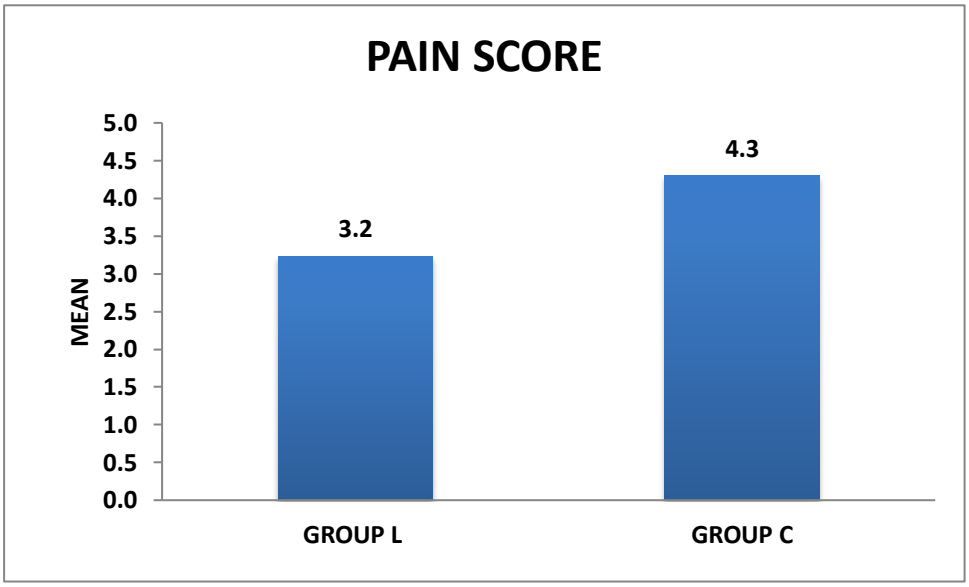


TABLE 9: MEAN PAIN SCORE BETWEEN GROUP L AND GROUP C

PARAMETERS	GROUP L		GROUP C		p value
	Mean	SD	Mean	SD	
PAIN SCORE	3.2	0.9	4.3	0.6	<0.001*

Note: * significant at 5% level of significance (p<0.05)

GRAPH 9: MEAN PAIN SCORE BETWEEN GROUP L AND GROUP



The pain score using VAS score was compared in both the procedures and was found that 12(26.1%) patients in L group had score 2, 14 patients (30.4%) had score of 3, 17 patients (37%) had score of 4 and 3 patients (6.5%) had score of 5. Whereas in C group, 5 patients (10.9%) had score of 3, 21 patients (45.7%) had score of 4, 20 patients (43.5%) had score of 5. The pain score is less in L group compared to that of the C group and is statistically significant. The mean pain score in L group is 3.2 and in C group its 4.3.

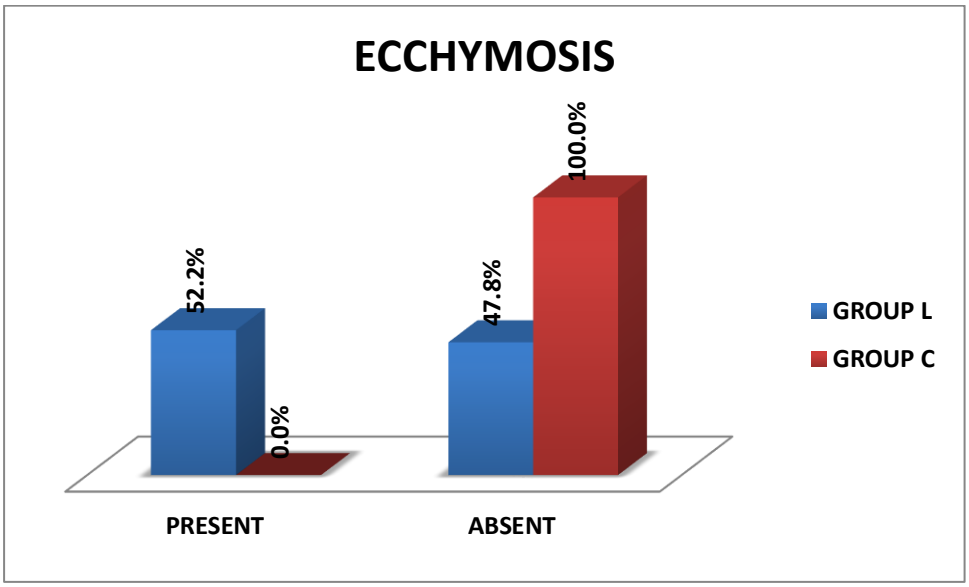
There was no much difference in the pain scores or discomfort in both the groups intraoperatively. (GRAPH 8,9) (TABLE 8,9)

TABLE 10: DISTRIBUTION OF ECCHYMOSIS BETWEEN GROUP L AND GROUP C

ECCHYMOSIS	GROUP L		GROUP C		p value
	N	%	N	%	
PRESENT	24	52.2%	0	0.0%	<0.001*
ABSENT	22	47.8%	46	100.0%	
Total	46	100.0%	46	100.0%	

Note: * significant at 5% level of significance (p<0.05)

GRAPH 10: DISTRIBUTION OF ECCHYMOSIS BETWEEN GROUP L AND GROUP C



The presence of ecchymosis on post op day 2 to around 1 week was present in 24 patients (52.2%) in L group. There was no ecchymosis seen in C group. This is statistically significant. The ecchymosis needed no further interventions apart from application of pressure bandage. (FIG 22) (GRAPH 10) (TABLE 10)

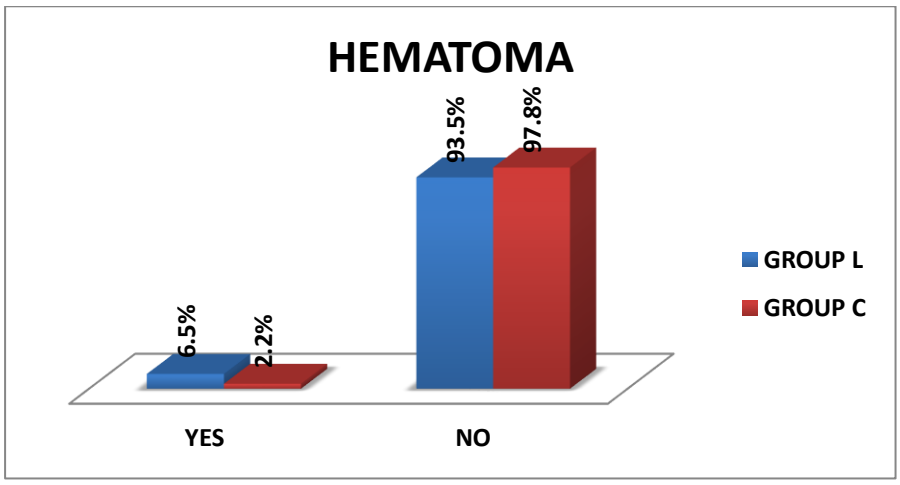
FIGURE 22: PRESENCE OF ECCHYMOSIS ON POST-OPERATIVE PERIOD IN GROUP L

TABLE 11: DISTRIBUTION OF HEMATOMA BETWEEN GROUP L AND GROUP C

HEMATOMA	GROUP L		GROUP C		p value
	N	%	N	%	
YES	3	6.5%	1	2.2%	0.307
NO	43	93.5%	45	97.8%	
Total	46	100.0%	46	100.0%	

Note: * significant at 5% level of significance (p<0.05)

GRAPH 11: DISTRIBUTION OF HEMATOMA BETWEEN GROUP L AND GROUP C

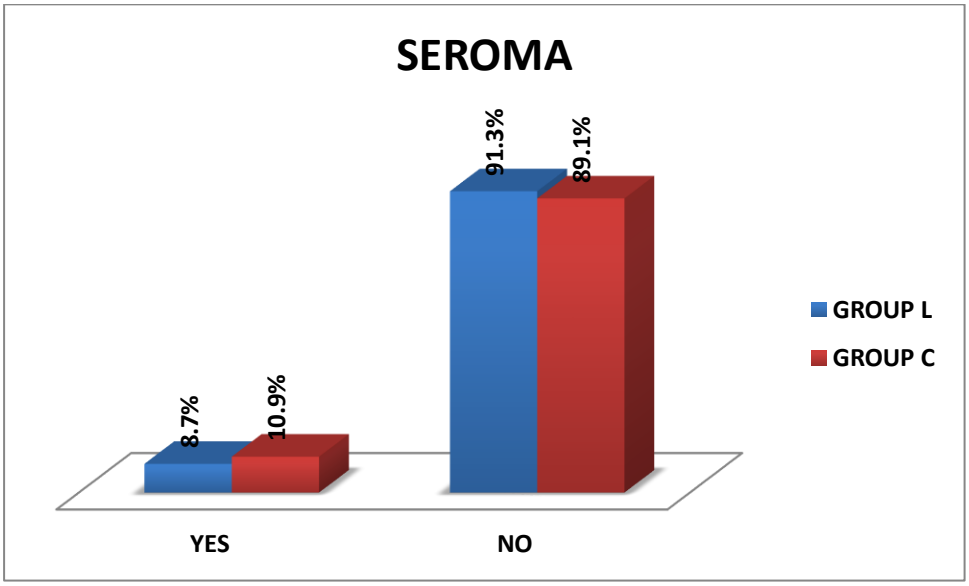


There was presence of hematoma in 3 patients (6.5%) in L group and 1 patient (2.2%0 in c group. Which is not statistically significant. (GRAPH 11) (TABLE 11)

TABLE 12: DISTRIBUTION OF SEROMA BETWEEN GROUP L AND GROUP C

SEROMA	GROUP L		GROUP C		p value
	N	%	N	%	
YES	4	8.7%	5	10.9%	0.726
NO	42	91.3%	41	89.1%	
Total	46	100.0%	46	100.0%	

GRAPH 12: DISTRIBUTION OF SEROMA BETWEEN GROUP L AND GROUP C

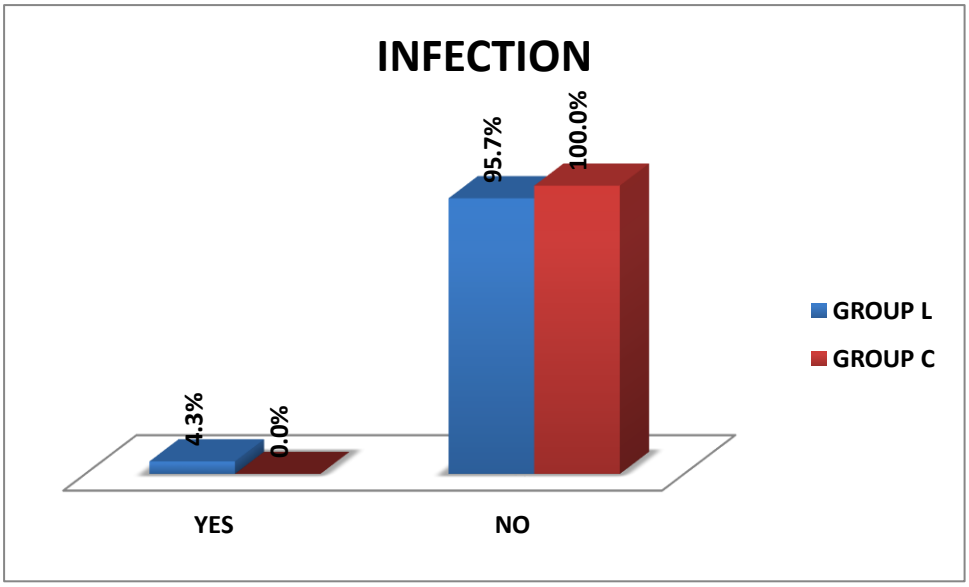


The seroma is formed in 4 patients (8.7%) in L group and 5 patients (10.9%) in C group. This is not statistically significant. The seroma formation was due to the large size of lipoma itself and did not need any further intervention except for aspiration. (GRAPH 12) (TABLE 12)

TABLE 13: DISTRIBUTION OF INFECTIONS BETWEEN GROUP L AND GROUP C

INFECTIONS	GROUP L		GROUP C		p value
	N	%	N	%	
YES	2	4.3%	0	0.0%	0.153
NO	44	95.7%	46	100.0%	
Total	46	100.0%	46	100.0%	

GRAPH 13: DISTRIBUTION OF INFECTIONS BETWEEN GROUP L AND GROUP C



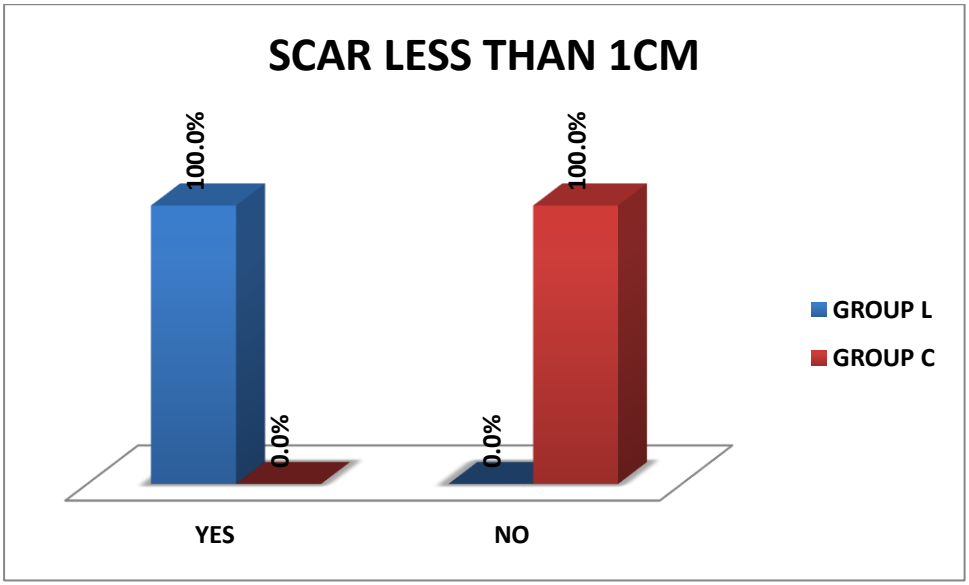
The infection was seen in 2 patients (4.3 %) in L group and none in C group. It is not statistically significant. (GRAPH 13) (TABLE 13)

TABLE 14: DISTRIBUTION OF SCARS BETWEEN GROUP L AND GROUP C

SCAR LESS THAN 1CM	GROUP L		GROUP C		p value
	N	%	N	%	
YES	46	100.0%	0	0.0%	<0.001*
NO	0	0.0%	46	100.0%	
Total	46	100.0%	46	100.0%	

Note: * significant at 5% level of significance (p<0.05)

GRAPH 14: DISTRIBUTION OF SCARS BETWEEN GROUP L AND GROUP C



It was observed that the all cases in L group had scar of less than 1 cm at the end of 3 months wherein C group had scar of more than 1 cm according to the size of the lipoma, thus proving liposuction gives a better aesthetic result. (FIG 23,24) (TABLE 14) (GRAPH 14)

FIGURE 23: SCAR SIZES IN VARIOUS PATIENTS OF GROUP L.

FIGURE 24: SCAR SIZES IN VARIOUS PATIENTS OF GROUP C.

FIGURE 25: FOLLOW UP OF A PATIENT OF GROUP L.

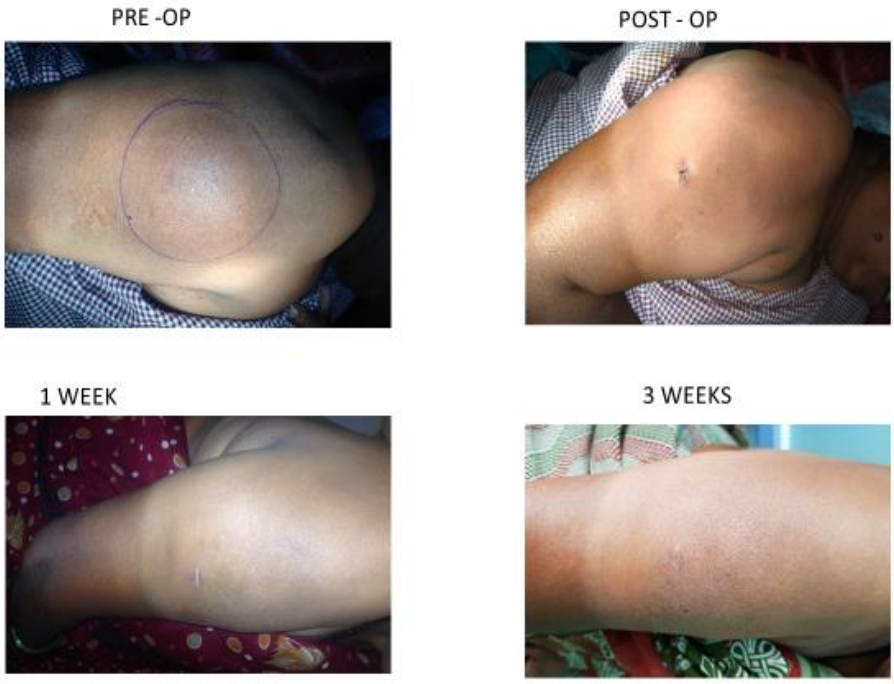


FIGURE 26: FOLLOW UP OF PATIENT IN GROUP C.

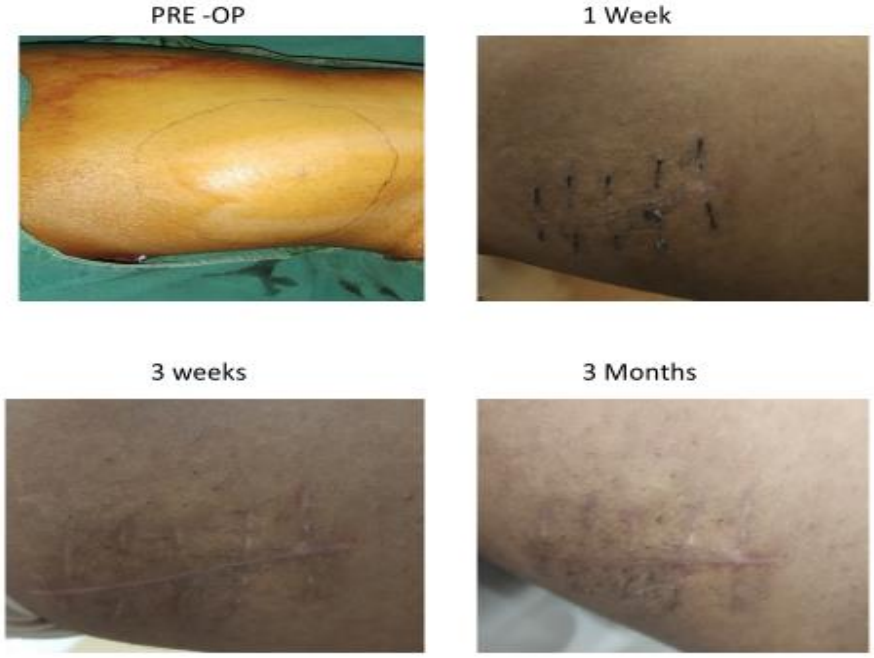


TABLE 15: RECURRENCE OF LIPOMAS BETWEEN GROUP L AND GROUP C

RECURRENCE	GROUP L		GROUP C		p value
	N	%	N	%	
NO	46	100.0%	46	100.0%	-
Total	46	100.0%	46	100.0%	

In both L group and C group there were no recurrences seen up to 3 months of follow up. Further follow up has not been done in the given study period. (TABLE 15)

FIGURE 27: THE SPECIMEN REMOVED IN GROUP C IN TOP ROW AND IN GROUP L IN BOTTOM ROW

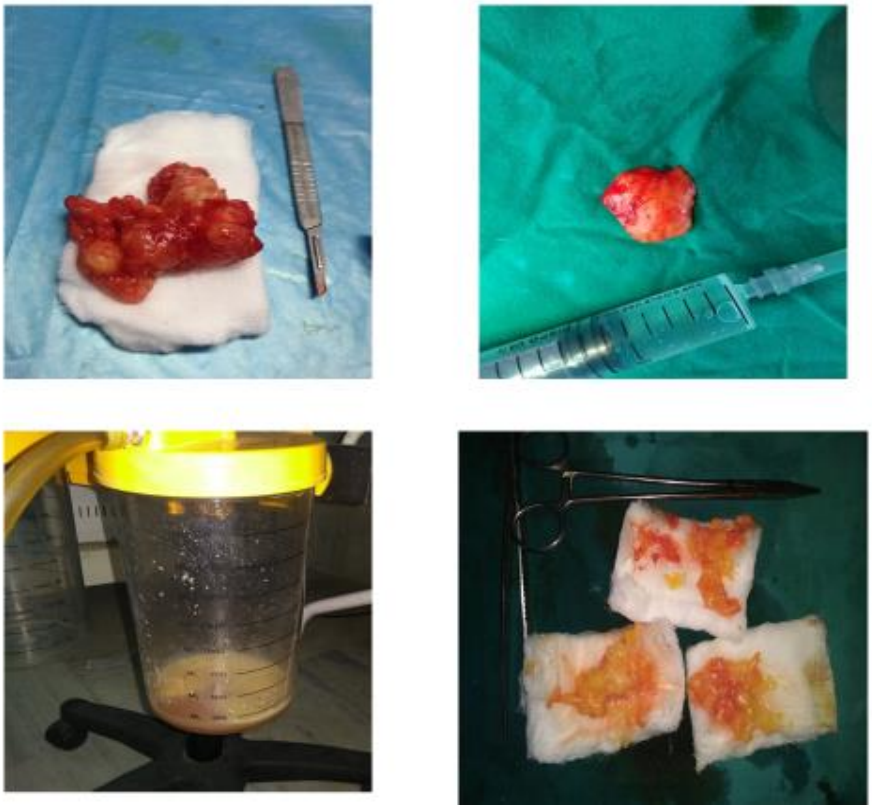
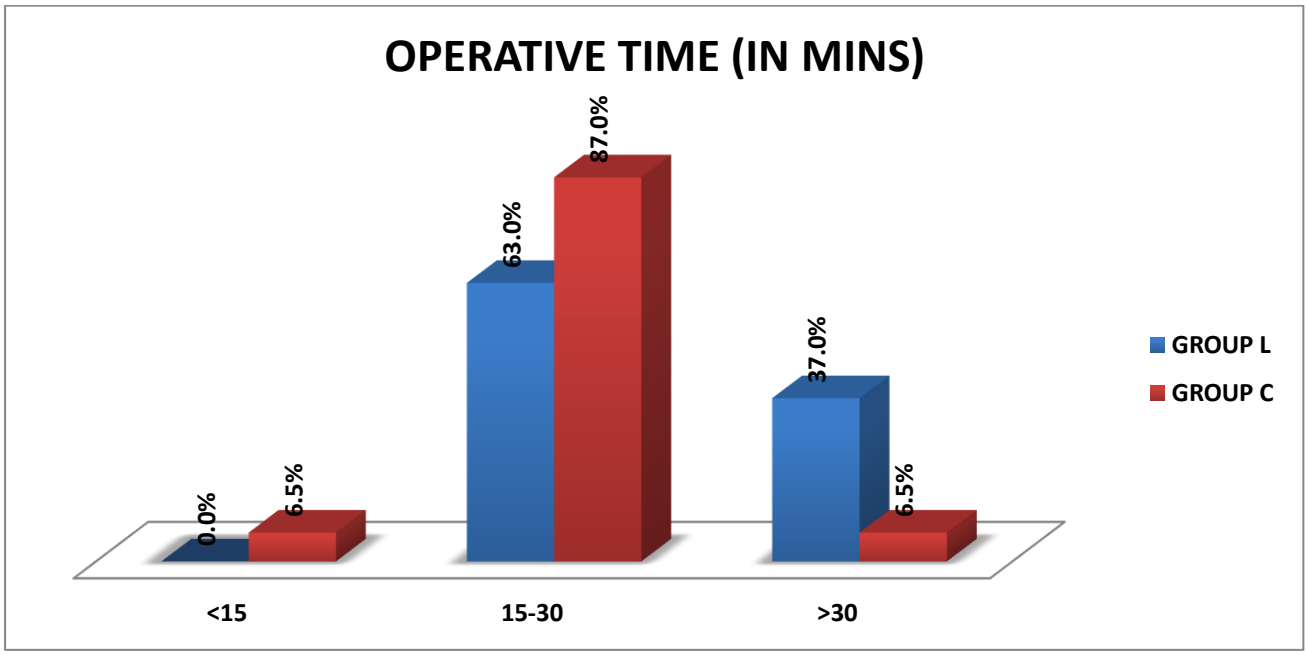


TABLE 16: DISTRIBUTION OF OPERATIVE TIME BETWEEN GROUP L AND C

OPERATIVE TIME (MIN)	GROUP L		GROUP C		p value
	N	%	N	%	
<15	0	0.0%	3	6.5%	0.001*
15-30	29	63.0%	40	87.0%	
>30	17	37.0%	3	6.5%	
Total	46	100.0%	46	100.0%	

Note: * significant at 5% level of significance (p<0.05)

GRAPH 15: DISTRIBUTION OF OPERATIVE TIME BETWEEN GROUP L AND C



The operative time was compared in both the groups. It was found that larger the lipoma more time was needed in both the groups. It was found that most of the cases needed 15-30mins from the time of the incision till suturing. None in group L could be done within 15mins since mechanical suction needs extra time. But the time for skin suturing is less in group L since only one or two sutures are needed. On an average lipoma sized more than 5-6 cm needed extra time for liposuction and removal of lipoma in fragments. 17 patients (37%)

in group L needed more than 30 mins. 29 patients (63%) needed 15-30mins in group L. 3 (6.5%) patients in group C needed less than 15mins, 40 patients (87%) needed 15-30 mins and 3 patients (6.5 %) needed more than 30mins. This is statistically significant. (TABLE 16) (GRAPH 15)

The FNAC and HPR report has been confirmed as Lipoma. There were no liposarcoma reported. The combined forms of lipoma were excluded from the study.

DISCUSSION:

Lipomas are benign tumour of fat cells. They are usually painless and doesn't need excision unless its symptomatic or for cosmetic reasons. In our study we have compared two surgical modalities of treatment for removal of the lipomas. This study included a total of 92 patients with subcutaneous lipoma in B.L.D.E. U's Shri. B. M. Patil Medical College, Hospital and Research Centre Vijaya Pura in the Department of Surgery during period of Nov 2017 – May 2019 who underwent surgery of which 46 underwent liposuction with excision through same incision under tumescent anaesthesia (group L) and the rest 46 underwent conventional excision (group C). The two groups were analysed and compared for various parameters. Initial analysis of site, size, number and plane of the swellings were analysed. Only the subcutaneous lipomas were selected. In the view to confirm diagnosis and to rule out liposarcoma or any other combined forms of lipomas like fibro lipoma/ angiolipoma, fine needle aspiration was done. The combined forms were excluded from the study. Later the patients were randomly allocated into either of the groups through chit picking. Once the procedure was completed few parameters were compared between both the group. Parameters like post-operative pain, post-operative hematoma/ ecchymosis, post- operative seroma / infections, the scar sizes and recurrences were compared in both the groups. We have excluded all patients with co-morbidities or bleeding disorders. Once the procedure was completed the sample had been for histopathological examination and the diagnosis was confirmed.

Liposuction has its role in treating obesity and maintaining body contours. Its role in treating lipoma was first described by Rubenstein *et al* in 1985 and concluded that it is an easy and safe method of removal of lipoma (78). Matthew Boyer *et al* has found that the liposuction us the most efficient method in removing fat tissue after reviewing various other methods of removal and is also FDA approved. (2)

Lipoma is most common in 30-50 years of the age. In our study 47 patients belonged to that age group of 30-50years including both the groups. This amounts to almost 51.1% of the cases. And most of the cases belonged to 20-50years. Among 92 patients study it was found that there were 53 (57.6%) males and 39(42.4%) females. Lipoma are usually four times more common in male than female. The reason for more female showing up to the hospital could be for cosmetic concerns. The main objective of the study was to compare the two surgical approaches and not the demographic characteristics.

In Igor Peev's study they studied 23 lipomas in 22 patients, among them 15 were female and 7 were male. The average age was 56 and range was from 32-74. (82) In Choi's study he studied 21 patients who underwent tumescent liposuction and among them nine were men and 12 were women. The mean age was 52.8 years. (84) In study conducted by Al-basti, 16 patients were studied for 6 years and found that they belonged to age group 19-54 years with mean age of 22.1years. Out of these, 9 were men and 7 were women. (60) In study conducted by Copeland where the liposuction and excision were combined to remove lipoma in 25 patients in 10years found that 17 were women and 8 were men. The age was 19-77 years with mean age 49.8years. (5)

In our study it was noted that there was no association between the obesity or alcohol consumption with lipoma occurrence. There was no history of any trauma followed by occurrence of lipoma in any of the cases studied. There is an unproven hypothesis that there is association of trauma, obesity and excessive alcohol consumption which causes Dercum's diseases. But in our study no such associations were observed. (2)

In our study, the size of the lipoma was comparable in each group. The mean diameter was 5 cm in liposuction with excision group and that of conventional group was 5.1cm. The cosmesis

and the parameters were better comparable in larger lipomas than the small ones because the smaller lipoma of sized 2-4cm needs almost small incision in both the groups. Hence larger sized lipomas were better to compare the effectiveness of the liposuction with extraction of the lipoma through the same incision. 22 patients out of 46 patients in L group had more than 5cm diameter and these cases were better comparable for cosmetic point of view, since in the L group, even the large lipomas needed small incisions. The fat tissues loosened out on infiltrating tumescent anaesthesia and using microcannula for suctioning out the fat tissues and break the fibrous tissues, then the remaining tissues was excised through the same incision even in large lipoma without extending the incision. Thus, leading to small scar formation. It was also seen that larger the size more chances of developing seroma

The study conducted by Igor Peev had 22 patients with 23 lipomas largest size being 14 X 26cm and average size was 9 x12 cm. (82) In Choi's study the lipomas sized between 1.2 to 11 cm, with mean size of 4.2cm. (84) In Al-basti's study the lipoma was sized from 4-25cm with mean size of 10cm.(60) In Copeland's study the average size was 5.4cm and range was 1 to 15cm. 7 patients had size less than 3 cm.(5)

The site of the lipomas was distributed all over the body in our study. In L group ,11 patients (23.9%) had in arm, 5 patients (10.9%) in axilla, 5 patients in back (10.9%), 1 patient over the chest (2.2%), 2 patients in the epigastrium (4.3%), 10 patients in forearm (21.7%), 1 in forehead (2.2%), 5 in the nape of the neck (10.9%), 1 over the scapula (2.2%) and 5 patients (10.9%) had over the thigh. In C group ,1 patient (2.2%) had in abdomen, 6 patients (13%) in arm , 1 patient (2.2%) in axilla, 9 patients over the back (19.6%) , 1 patient in the epigastrium(2.2%) , 11 patients in forearm (23.9%), 1 in gluteal(2.2%), 8 in the nape of the neck (17.4%), 1 over the scapula and shoulder each (2.2% each) and 6 patients (13%) had over the thigh. Thus, most commonly the lipoma was more common in arms, forearms, back and nape of neck.

According to study Igor Peev the 30% lipoma were on back and 22 % in extremities. (82) In Choi's study 16 lipomas were on the extremities, 12 on trunk and abdomen and 3 in head and neck region. (84) In Copeland's study it was found that 2 lipomas were present on head and neck, 2 on abdomen, 31 on extremities and 2 on the groin. (5)

In our study majority of the patients (85 patients) the lipomas were single. In 5 patients in L group and in 2 patients in C group had multiple lipomas over forearm. Since the lipomas was not close to each other the single incision could not be made to remove two or more lipoma in case of L group.

According to Igor Peev study only one patient had two lipomas. (82) In Choi's study among 21 patients 3 patients had multiple lipomas, and 31 lipomas were removed. (84) In Al-basti's study out of 16 patients , 11 had solitary giant lipoma and six patients had many lipomas.(60) In Copeland's study it was seen 6 patients had multiple and 19 had single lipomas. A total of 48 lipomas were removed from 25 patients using combined liposuction and excision. (5)

The pain scores were compared in both the groups in our study after the procedure on post-operative day 1 using VAS score and found that the mean pain score in L group was 3.2 and in C group was 4.3. The reason may be the need for less sutures in L group compared to C group. This is found statistically significant. In Peev's study the pain was minimal and did not affect the daily activity (82)

In our study we have observed that there was ecchymosis in many cases following liposuction with excision. The presence of ecchymosis on post op day 2 to around 1 week was present in 24 patients (52.2%) in L group. There was no ecchymosis seen in C group. This is statistically significant. The ecchymosis needed no further interventions apart from application of pressure bandage continuously. The reason behind the ecchymosis is due to the micro cannula insertion and to and fro movements that leads to ecchymosis and pinching of

the skin to deliver the fat tissue from the same incision. The application of pressure bandage for a brief period of time is cumbersome to the patients and may be a disadvantage of the procedure.

The hematoma was present in 3 patients (6.5%) in L group and 1 patient (2.2%) in C group. Which is not statistically significant. Only in one patient in group L, the suture had to be removed in order to drain the hematoma. But in rest of the cases it has resolved on its own.

The seroma is formed in 4 patients (8.7%) in L group and 5 patients (10.9%) in C group. This is not statistically significant. The seroma formation was due to the large size of lipoma itself and did not need any further intervention except for aspiration. The application of pressure bandage and adequate antibiotics were sufficient in these cases. If liposuction as a technique is taken into consideration, then we can say that the rates are acceptable, according to Dixit *et al* all the complications are minor (local) and no major (systemic) complications were advocated. There was no need of further treatments.

In group L, 2 cases were infected. None were infected in group C. There was minimal pus discharge and needed culture-based antibiotics. The reason behind this was lack of hygiene by the patient.

In Igor Peev's study, there was oedema and ecchymosis in early postoperative period. There was no need for further interventions for the above and resolved on its own. In two large sized cases which developed seroma, aspiration was done. There was no hematoma. (82)

In Choi's study the lipomas were successfully removed in 23 cases without any complications. In 3 cases fat tissue was left behind and these were found on the back. In 3 cases bruises were found but it spontaneously resolved without need for further intervention. Hematoma and dimpling were seen in these cases which required no further interventions. (84)

In Al-basti's study they have followed 16 patients for complications and found no hematoma or seroma but they had advised all patients to wear compression bandage for 6 weeks post-operatively. In this study the capsule was removed with artery forceps and removed through same incision. (60) In Copeland's study they observed 1 patient with 10cm lipoma developed hematoma and 1 patient 15 cm lipoma developed in early postoperative period. In this study 18 patients needed repeated aspiration and there was no use of additional drain in these cases to avoid additional incision. (5)

In our study its observed that end of 3months follow up the scar size in all the L group patients was less than 1 cm since a very small incision is made to allow the micro cannula enter and in cases of larger lipomas the incision was little extended in order to deliver the remaining tissues out through same incision. The overall scar after 3 months was less than 1 cm in cases of L group. This is statistically significant.

In Igor Peev's study the average follow up period was around 25 months, and they have noticed that the scar is almost unnoticeable. But they have noticed that in 13 % cases skin irregularities are seen and in 8.7% cases there is indentation. In all other studies the scar is minimal when liposuction was used. (82)

It was observed in our study that there was no recurrence in any cases in both the groups which were followed up to August 2019. In few cases, follow up could be done only up to three months due to the restricted study period. This duration for follow up to look for recurrence is too short and is a limitation of the study.

Recurrence risk in open lipectomy is around 2%. All studies published in the literature about suction assisted lipectomy have limited number of cases that can estimate that risk of 2% or less. Raemdonck et al comparative study with 30 cases included, reported unacceptable higher recurrence risk in liposuction treated cases. Still, this study included giant lipomas only and is one of the oldest that might have implication on technical skills at that time. (83) Recent studies

advocate the effectiveness. In Igor Peev's study the average follow up months is around 25 months and it is no recurrence have been noted. (82) In Choi's study out of 21 patients, 12 cases were followed up for 2 years and no recurrence was found. (84) In Al-basti's study they have followed up 16 patients for 3-4 years and found no recurrence. (60) In Copeland's study it was followed up for 6.5years and found no recurrence in 23 patients nor they noticed any malignant changes and scar was very minimal. (5)

In our study none of the histopathology has been reported as liposarcoma and confirmation of encapsulated could not be done in all cases of L group since it was sent in fragments. And capsule was excised from the same incision. Our observations show that in some lipomas, the residual tissue/capsule can be suctioned, mechanically destroyed/ removed by forceps. It has also been observed that liposuction with excision needs a little longer time compared to that of the conventional excision. This is statistically significant This difference can be reduced by using power-assisted or other newer methods of liposuction.

Limitations of the study: In order to rule out long term complications like recurrence rate, the follow up period must be higher. Since our study period is limited the rate of recurrence cannot be concluded with these procedures. Other additional aids like power assisted liposuction, ultrasound assisted liposuction, lasers were not used in this study. These aids have its own advantages over mechanical liposuction in spite them being more expensive. Hence liposuction with mechanical suction was more economical.

8. 8.CONCLUSION:

1. Liposuction with tumescent anesthesia could be done as a simple outpatient procedure similar to that of the conventional excision. The remaining tissue with capsule could be excised from the same incision without extending the incision.

2. It has been observed that liposuction with excision under tumescent anesthesia was found less painful compared to that of conventional therapy post-operatively.

3. The post-operative ecchymosis may develop in patients undergoing liposuction but since its self-resolving and a minor complication. There is a need for application of compression bandage for the patients postoperatively.

4. The scar size was less than 1 cm in all the cases of liposuction with excision group irrespective of the size of the lipoma. Thus, providing a better aesthetic value

5. There is no need of special training to perform this technique.

6. Liposuction with excision is more time consuming than conventional excision but gives better aesthetic results. The larger lipomas need more time due to multiple punctures and need for longer time of liposuction lead to discomfort for the patient.

7. No recurrence seen, although long term follow up is needed to know the recurrence rate.

Thus, combined liposuction and excision is a much safer alternative for lipoma removal than conventional surgical excision. Liposuction performed through small incision provides satisfactory aesthetic results and excision through the same incision of the remaining tissue and capsule may minimize the rate of

recurrence. This procedure can be performed on outpatient basis. The special equipment's like power assisted liposuction or lasers can be used rather than mechanical liposuction to reduce the operative time and reduce the fatigue to the surgeon.

9.SUMMARY:

A prospective clinical study to compare two modalities of surgical treatment for subcutaneous lipoma was conducted at BLDE's (DU) Shri B M Patil medical college and hospital from November 2017 to May 2019. A total of 92 patients with subcutaneous lipoma were selected based on the inclusion and exclusion criteria, and divided into two groups of 46 patients in each. After confirmation of diagnosis with fine needle aspiration the patients underwent either conventional surgical excision (group C) or combined liposuction with excision through same incision under tumescent anesthesia (group L). The size of the lipoma varied from 2- 10cm in diameter and was present all over the body especially in extremities, back, axilla and neck. The post-operative parameters like pain score, ecchymosis, hematoma, seroma, infection, scar size and recurrence were studied in both the groups. The results were compared using Student 't' test, Chi square test, Paired 't' test and Fishers exact test. There was a statistically significant ($p < 0.001$) difference in the pain score and scar size in group L. But combined liposuction with excision has disadvantage of developing ecchymosis postoperatively and needs more time to operate by using mechanical suction. There is need for applying elastocompressive bandage post operatively to minimize ecchymosis and usage of power assisted suction could reduce the operative time in case of large lipomas. However, time taken for small lipomas is almost equal in both groups. In case of multiple lipomas, a single incision can be used to remove two or more nearby swellings.From the study it can be concluded that tumescent liposuction with excision is a safe and an aesthetically better alternative for conventional excision for subcutaneous lipoma. There was self-resolving minor complication like ecchymosis post operatively in liposuction. There was no recurrence in any of the patients in both the groups but this needs a longer duration of study for definitive conclusion.

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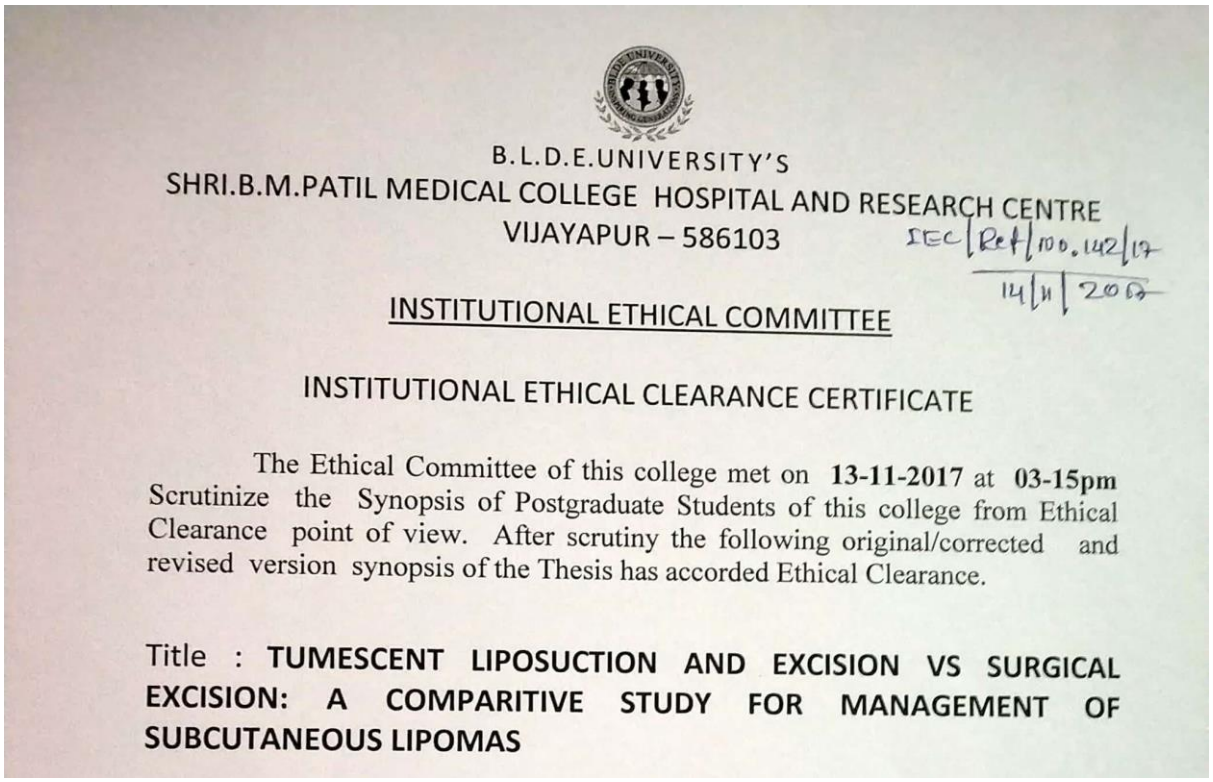
11. ANNEXURE I – ETHICAL CLEARANCE CERTIFICATE



B.L.D.E.UNIVERSITY'S
SHRI.B.M.PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE
VIJAYAPUR – 586103

IEC/Ref/100.142/17
14/11/2017

INSTITUTIONAL ETHICAL COMMITTEE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this college met on **13-11-2017** at **03-15pm** Scrutinize the Synopsis of Postgraduate Students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has accorded Ethical Clearance.

Title : **TUMESCENT LIPOSUCTION AND EXCISION VS SURGICAL EXCISION: A COMPARITIVE STUDY FOR MANAGEMENT OF SUBCUTANEOUS LIPOMAS**

12. ANNEXURE II – SAMPLE INFORMED CONSENT FORM:

TITLE OF THE PROJECT : **TUMESCENT LIPOSUCTION AND EXCISION VS SURGICAL EXCISION: A COMPARITIVE STUDY FOR MANAGEMENT OF SUBCUTANEOUS LIPOMAS**

PURPOSE OF RESEARCH:

I have been informed that this study is conducted to prove that liposuction with excision of lipomas will be a safer alternative and aesthetically better option than conventional surgical excision in management of lipomas.

PROCEDURE:

I am aware that in addition to routine care received I will be asked series of questions by the investigator. I have been asked to undergo the necessary investigations and treatment, which will help the investigator in this study.

Patients who met the inclusion criteria are randomly assigned a control group i.e. those who undergo surgical excision (Group C) or liposuction with excision group (Group L). 46 lipomas will be removed by tumescent liposuction with excision (Group L), while the other 46lipomas in the control group (Group C) will be treated with conventional surgical excision.

The conventional surgical excision will be done by linear incision followed by dissection of capsule and removal of the lipoma under local/regional/general/spinal anaesthesia based on the site.

In tumescent liposuction, small incisions of 1–3 cm at key locations are performed in the target area. About 2-3ml of Klein's fluid (per ml of fat aspirated), composed of saline, dilute epinephrine and lignocaine, are injected. The saline balloons fat tissue, epinephrine causes vasoconstriction, and lignocaine induces local anaesthesia.

Liposuction solution :1 litre bag of NS solution 50 ml of 1% plain lignocaine 1 ml of epinephrine (1:100,000)

A microcannula, typically 2–3 mm in diameter, is introduced to aspirate adipose tissue and remaining tissue and capsule is extracted through the same incision.

RISK AND DISCOMFORTS:

I understand that I may experience some pain and discomforts during the examination or during my treatment. This is mainly the result of the procedures of this study are not expected to exaggerate these feelings which are associated with the usual course of treatment.

BENEFITS:

I understand that my participation in the study will help to compare liposuction with excision against conventional surgical excision, in aesthetic point of view in management of subcutaneous lipomas.

CONFIDENTIALITY:

I understand that the medical information produced by this study will become a part of hospital records and will be subject to the confidentiality. Information of sensitive personal nature will not be part of the medical record, but will be stored in the investigations research file.

If the data are used for publication in the medical literature or for teaching purpose, no name will be used and other identifiers such as photographs will be used only with special written permission. I understand that I may see the photograph before giving the permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study to **investigator** in the Department of General Surgery who will be available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might influence my continued participation. A copy of this consent form will be given to me to keep for careful reading.

REFUSAL FOR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and that I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice. I also understand that **investigator** may terminate my participation in the study after he has explained the reasons for doing so.

INJURY STATEMENT:

I understand that in the unlikely event of injury to me resulting directly from my participation in this study, if such injury were reported promptly, the appropriate treatment would be available to me. But, no further compensation would be provided by the hospital. I understand that by my agreements to participate in this study and not waiving any of my legal rights.

I have explained to _____the purpose of the research, the procedures required and the possible risks to the best of my ability.

_____ _____

Date

(Investigator)

STUDY SUBJECT CONSENT STATEMENT:

I confirm that investigator has explained to me the purpose of research, the study procedure, that I will undergo and the possible discomforts as well as benefits that I may experience in my own language. I have been explained all the above in detail in my own language and I understand the same. Therefore, I agree to give consent to participate as a subject in this research project.

_____ _____

(Participant) Date

_____ _____

(Witness to signature) Date

13. ANNEXURE III – PROFORMA

SL NO

Name

Age IP NO

Sex UNIT

Religion DOA

Occupation DOD

Address:

Mobile No:

Associated Co-morbidities (if any):

HISTORY OF PRESENT ILLNESS:

PERSONAL HISTORY:

GENERAL PHYSICAL EXAMINATION:

Built: Well/Moderate/Poor

Nourishment: Well/Moderate/Poor

Temperature: Pulse: SPO2:

B.P: Respiratory Rate:

LOCAL EXAMINATION:

SYSTEMIC EXAMINATION:

Per Abdomen

Respiratory System

Cardio Vascular System

Central Nervous System

LABORATORY TESTS

Haemoglobin% :

Total Count :

Platelets :

Differential Count

Neutrophil :

Lymphocytes :

Eosinophils :

Basophils :

Monocytes :

Blood Urea :

Serum Creatinine :

HIV :

HBsAg :

BT/ CT :

Ultrasonography (if required):

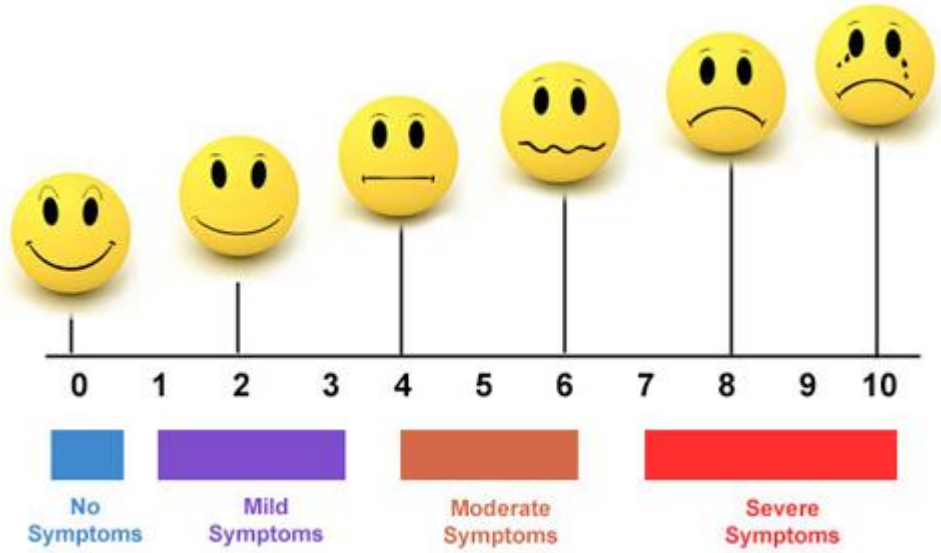
OTHERS:

FNAC:

HPR:

DIAGNOSIS:

:



Follow up:

1week:

3weeks:

3months:

14. ANNEXURE IV – MASTER CHART

SL NO	NAME	AGE	SEX	IP/OPNO	DATE OF PROCEDURE	GROUP L/C	SINGLE /MULTIPLE	SITE	SIZE	PAIN SCORE	ECCHYMOSIS	HEMATOMA	SEROMA	INFECTION	SCAR LESS THAN 1CM	RECURRENCE	OPERATIVE TIME(MINS)
1	PARASHURAM S	27	M	37314	02.11.2017	L	MULTIPLE-03	LEFT FOREARM(2) LEFT ARM(1)	3 X 3 : 2 X 2 : 5X 5	4	PRESENT	NO	NO	NO	YES	N0	45
2	YASHWANTH K	25	M	38281	09.11.2017	L	MUTIPLE-04	RIGHT FOREARM (3) RIGHT ARM(1)	2X2 : 2X2 ;3X2 ; 2X2	4	PRESENT	NO	NO	NO	YES	N0	30
3	BASAWWA	45	F	42250	09-12-2017	L	SINGLE	LEFT ARM	5X5	4	PRESENT	YES	NO	NO	YES	N0	30
4	SHEKAWWA	48	F	4526	06-02-2018	L	SINGLE	RIGHT ARM	8X8	3	PRESENT	NO	NO	NO	YES	N0	40
5	MALLAGOUDA	50	M	41318	08-02-2018	L	SINGLE	NAPE OF NECK	3X2	3	ABSENT	NO	NO	NO	YES	N0	20
6	RAMANGOUDA	28	M	7815	05-03-2018	L	SINGLE	RIGHT FOREARM	2X2	4	ABSENT	NO	NO	NO	YES	N0	2O
7	SUNIL TOPU	18	M	9547	24-03-2018	L	SINGLE	RIGHT SCAPULA	8X4	2	ABSENT	NO	YES	YES	YES	N0	40
8	SHIVASHARAN	35	M	10628	27-03-2018	L	SINGLE	EPIGASTRIUM	2X2	4	ABSENT	NO	NO	NO	YES	N0	20
9	JAKKAWWA VITAL	35	F	10827	04-04-2018	L	SINGLE	RIGHT THIGH	6X3	2	PRESENT	NO	NO	NO	YES	N0	30
10	MAHANTESH BIRADAR	56	M	11708	10-04-2018	L	SINGLE	LEFT NECK	3X3	4	ABSENT	NO	NO	NO	YES	N0	20
11	HAJIMALAGA	35	M	125111	10-04-2018	L	SINGLE	LEFT FOREARM	2X2	3	ABSENT	NO	NO	NO	YES	N0	20
12	MAHESH MALI	25	M	146200	24-04-2018	L	SINGLE	LEFT LOWERBACK	5X5	2	PRESENT	NO	NO	NO	YES	N0	30
13	RAMAPPA S	40	M	154411	02-05-2018	L	SINGLE	EPIGASTRIUM	3X3	3	PRESENT	NO	NO	NO	YES	N0	20
14	SHARANAMMA M	58	F	158929	05-05-2018	L	SINGLE	LEFT ARM	4X4	3	ABSENT	NO	NO	NO	YES	N0	25
15	KASHINATH GANGU	45	M	18136	29-05-2018	L	SINGLE	LEFT AXILLA	8X5	4	PRESENT	YES	NO	NO	YES	N0	40
16	BHIMU BHOJU	45	M	17051	29-05-2018	L	SINGLE	NAPE OF NECK	3X3	3	ABSENT	NO	NO	NO	YES	N0	20
17	VK PATIL	52	M	177875	31-05-2018	L	SINGLE	RIGHT THIGH	5X3	2	PRESENT	NO	NO	NO	YES	N0	35
18	KALLAPA BILAGI	42	M	195080	05-06-2018	L	SINGLE	NAPE OF NECK	2.5X2.5	4	ABSENT	NO	NO	NO	YES	N0	20
19	NIRMALA	42	F	188454	07-06-2018	L	SINGLE	RIGHT ARM	10X6	4	PRESENT	NO	NO	NO	YES	N0	36
20	LAKSHMIBAI A	52	F	19275	13-06-2018	L	SINGLE	RIGHT FOREAEM	5X3	2	PRESENT	NO	NO	NO	YES	N0	30
21	JAKAPPA S	54	M	19874	19-06-2018	L	SINGLE	LEFT AXILLA	8X5	4	PRESENT	YES	YES	YES	YES	N0	45
22	BANASHANKARI	32	F	224457	03-07-2018	L	SINGLE	RIGHT ARM	6X5	2	PRESENT	NO	NO	NO	YES	N0	40
23	MD GOUS	29	M	222316	16-07-2018	L	SINGLE	LEFT LOWERBACK	3X3	2	ABSENT	NO	NO	NO	YES	N0	20
24	LAKSHMIBAI B	45	F	25042	30-07-2018	L	SINGLE	RIGHT FOREARM	4X3	4	PRESENT	NO	NO	NO	YES	N0	30
25	VITTAL PUJARI	38	M	296566	31-08-2018	L	SINGLE	RIGHT ARM	3X2	4	ABSENT	NO	NO	NO	YES	N0	20
26	KISHORE TUKARAM	40	M	28223	31-08-2018	L	SINGLE	RIGHT LOWERBACK	10X6	2	ABSENT	NO	YES	NO	YES	N0	45
27	JAGADISH D	25	M	31504	19-09-2018	L	SINGLE	RIGHT FOREARM	4X2	3	ABSENT	NO	NO	NO	YES	N0	15
28	KAVERI PUJARI	21	F	355535	04-10-2018	L	SINGLE	RIGHT FOREARM	4X2	2	ABSENT	NO	NO	NO	YES	N0	15
29	SHAILA GANGAPPA	38	F	30259	09-10-2018	L	SINGLE	RIGHT THIGH	10X5	5	PRESENT	NO	NO	NO	YES	N0	45
30	SACHIN BHEMANNA	23	M	35019	20-10-2018	L	SINGLE	RIGHT BACK	5X4	3	PRESENT	NO	NO	NO	YES	N0	35
31	ARAVIND RATHOD	31	M	364397	23-10-2018	L	MULTIPLE-02	B/L FOREARM	3X2 ; 4X3	3	PRESENT	NO	NO	NO	YES	N0	30
32	BHEEMABAI	40	F	3471	03-02-2019	L	SINGLE	RIGHT ARM	5X4	2	ABSENT	NO	NO	NO	YES	N0	35
33	SHEKAPPA	46	M	48195	06-02-2019	L	SINGLE	RIGTH SIDE OF NECK	2X2	4	ABSENT	NO	NO	NO	YES	N0	15
34	SARASWATI	55	F	81544	05-03-2019	L	SINGLE	LEFT THIGH	6X3	3	ABSENT	NO	NO	NO	YES	N0	25
35	MAHESH U	19	M	7755	12-03-2019	L	SINGLE	RIGHT FOREARM	4X3	3	PRESENT	NO	NO	NO	YES	N0	20
36	JEETENDRASINGH	19	M	8301	16-03-2019	L	MULTIPLE 02	BACK	4X3	2	ABSENT	NO	NO	NO	YES	N0	20
37	BASAMMA SIDANNA	45	F	8176	22-03-2019	L	SINGLE	RIGHT AXILLA	6X5	4	PRESENT	NO	YES	NO	YES	N0	30
38	SUSHEELA BALAWANT	50	F	10830	03-04-2019	L	SINGLE	LEFT AXILLA	7X3	3	ABSENT	NO	NO	NO	YES	N0	45
39	DEVAMMA S	34	F	9735	05-04-2019	L	SINGLE	RIGHT ARM	6X5	4	ABSENT	NO	NO	NO	YES	N0	40
40	BASAVARAJ	25	M	123805	12-04-2019	L	SINGLE	RIGTH CHEST	4X3	3	ABSENT	NO	NO	NO	YES	N0	30
41	MAHADEVI S	50	F	12525	26-04-2019	L	SINGLE	RIGHT FOREHEAD	4X3	5	ABSENT	NO	NO	NO	YES	N0	35
42	SUMANGALA ASHOK	47	F	11979	29-04-2019	L	SINGLE	LEFT ARM	10X5	4	PRESENT	NO	NO	NO	YES	N0	45
43	SHREDEVI S	25	F	134848	09-05-2019	L	SINGLE	LEFT THIGH	3X2	2	PRESENT	NO	NO	NO	YES	N0	20
44	GIRIMALAPPA	47	M	14088	09-05-2019	L	SINGLE	LEFT ARM	9X5	3	PRESENT	NO	NO	NO	YES	N0	45
45	MANGALA MAHESH	22	F	15593	21-05-2019	L	MULTIPLE -2	B/L AXILLA	4X4;5X4	5	PRESENT	NO	NO	NO	YES	N0	30
46	RAJASHREE H	20	F	170960	22-05-2019	L	SINGLE	LEFT ARM	4X3	4	PRESENT	NO	NO	NO	YES	N0	20
47	**PARASHURAM**	**25**	**M**	**362645**	**04-11-2017**	**C**	**SINGLE**	**LEFT LOWER BACK**	**5X5**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**30**
48	**MAHADEV**	**50**	**M**	**30150**	**15-11-2017**	**C**	**SINGLE**	**NAPE OF NECK**	**3X3**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**15**
49	**NAGAPPA**	**44**	**M**	**41521**	**01-12-2017**	**C**	**SINGLE**	**BACK**	**5 X 5**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**25**
50	**GURUBAI**	**44**	**F**	**44754**	**29-12-2017**	**C**	**SINGLE**	**BACK**	**10 X 4**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**30**
51	**VEERABADRAPPA**	**58**	**M**	**343**	**03-01-2018**	**C**	**SINGLE**	**BACK**	**4 X 3**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**20**
52	**APPASHI**	**60**	**M**	**4030**	**06-02-2018**	**C**	**SINGLE**	**NAPE OF NECK**	**4 X 3**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**15**
53	**HELWAKKA**	**60**	**F**	**4566**	**16-02-2018**	**C**	**SINGLE**	**BACK**	**3 X 3**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**15**
54	**CHIDANAND**	**30**	**M**	**63842**	**23-02-2018**	**C**	**SINGLE**	**BACK**	**5 X 5**	**5**	**ABSENT**	**YES**	**NO**	**NO**	**NO**	**NO**	**20**
55	**BANU INAMDAR**	**50**	**M**	**6859**	**26-02-2018**	**C**	**SINGLE**	**BACK**	**3 X 2**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**15**
56	**BASALINGAMMA**	**32**	**F**	**37314**	**13-03-2018**	**C**	**SINGLE**	**BACK**	**4 X 3**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**12**
57	**NINGANNA H**	**50**	**M**	**17054**	**31-03-2018**	**C**	**SINGLE**	**LEFT ARM**	**10 X 5**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**25**
58	**LALITA RATHOD**	**28**	**F**	**134456**	**17-04-2018**	**C**	**SINGLE**	**RIGHT FOREARM**	**2 X 2**	**3**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**10**
59	**BASAVARAJ**	**24**	**M**	**17834**	**03-05-2018**	**C**	**SINGLE**	**RIGHT FOREARM**	**4 X 2**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**15**
60	**SUGALABAI S**	**45**	**F**	**17513**	**16-05-2018**	**C**	**SINGLE**	**RIGHT ARM**	**6 X 5**	**4**	**ABSENT**	**NO**	**YES**	**NO**	**NO**	**NO**	**18**
61	**INDIRABAI**	**40**	**F**	**18037**	**04-06-2018**	**C**	**SINGLE**	**LEFT THIGH**	**6 x 5**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**20**
62	**YELLAPPA DALAWAI**	**27**	**M**	**19069**	**13-06-2018**	**C**	**SINGLE**	**BACK**	**3 X 2**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**15**
63	**KAMALABAI I**	**42**	**F**	**19813**	**24-06-2018**	**C**	**SINGLE**	**RIGHT THIGH**	**4 X 3**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**15**
64	**SURESH H**	**47**	**M**	**20681**	**25-06-2018**	**C**	**SINGLE**	**EPIGASTRIUM**	**5 X 3**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**25**
65	**IRANNA S**	**27**	**M**	**21783**	**03-07-2018**	**C**	**SINGLE**	**RIGHT FOREARM**	**4 X 3**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**20**
66	**SADASHIV H**	**19**	**M**	**22380**	**07-07-2018**	**C**	**SINGLE**	**RIGHT FOREARM**	**3 X 2**	**3**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**15**
67	**VIDYA**	**34**	**F**	**241234**	**15-07-2018**	**L**	**SINGLE**	**RIGHT FOREARM**	**3 X 2**	**3**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**10**
68	**VISHWANATH M**	**48**	**M**	**24837**	**16-07-2018**	**C**	**SINGLE**	**RIGHT ARM**	**5 X 3**	**4**	**ABSENT**	**NO**	**YES**	**NO**	**NO**	**NO**	**20**
69	**NAGAMMA**	**60**	**F**	**245209**	**26-07-2018**	**C**	**SINGLE**	**RIGHT THIGH**	**5 X 4**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**25**
70	**GOLLAL S**	**56**	**M**	**25274**	**04-08-2018**	**C**	**SINGLE**	**RIGHT THIGH**	**8 X 6**	**5**	**ABSENT**	**NO**	**YES**	**NO**	**NO**	**NO**	**30**
71	**PRAKASH HARILAL**	**35**	**M**	**27866**	**06-08-2018**	**C**	**SINGLE**	**NAPE OF NECK**	**7 X 5**	**5**	**ABSENT**	**NO**	**YES**	**NO**	**NO**	**NO**	**35**
72	**KENCHAWWA**	**40**	**F**	**25129**	**14-08-2018**	**C**	**SINGLE**	**RIGHT ARM**	**5 X 4**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**25**
73	**CHANDIBAI S**	**45**	**F**	**34118**	**06-09-2018**	**C**	**SINGLE**	**NAPE OF NECK**	**5 X 4**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**25**
74	**SHANTAPPA MAHADEV**	**60**	**M**	**30243**	**10-09-2018**	**C**	**SINGLE**	**LEFT SCAPULA**	**6 X 4**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**30**
75	**SHRISHAIL N**	**60**	**M**	**32690**	**14-09-2018**	**C**	**SINGLE**	**RIGHT THIGH**	**10 X 5**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**45**
76	**BASSU DEVAPPA**	**55**	**M**	**294150**	**16-09-2018**	**C**	**SINGLE**	**NAPE OF NECK**	**3 X 3**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**20**
77	**ROOPA M**	**23**	**F**	**34470**	**18-10-2018**	**C**	**SINGLE**	**NAPE OF NECK**	**3 X 2**	**3**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**20**
78	**RENUKA BAI**	**36**	**F**	**39580**	**05-11-2018**	**C**	**SINGLE**	**RIGHT AXILLA**	**7 X 5**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**35**
79	**SHASHIKALA KIRAN**	**28**	**F**	**38228**	**16-11-2018**	**C**	**SINGLE**	**RIGHT ARM**	**7 X5**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**25**
80	**RAMAGOUDA PANDIT**	**45**	**M**	**38601**	**20-11-2018**	**C**	**SINGLE**	**NAPE OF NECK**	**5 X 5**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**25**
81	**MAHADEVI SK**	**45**	**F**	**42014**	**03-12-2018**	**C**	**MULTIPLE**	**B/L FOREARM AND BACK -3**	**4X3 , 4X3, 4X3**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**20**
82	**MAYAPPA**	**45**	**M**	**42904**	**16-12-2018**	**C**	**SINGLE**	**LEFT GLUTEAL**	**10 X 7**	**5**	**ABSENT**	**NO**	**YES**	**NO**	**NO**	**NO**	**25**
83	**DEEPAK KUSUR**	**23**	**M**	**437093**	**24-12-2018**	**C**	**SINGLE**	**RIGHT FOREARM**	**3 X 2**	**3**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**15**
84	**KALAPPA L**	**35**	**M**	**438833**	**27-12-2018**	**C**	**SINGLE**	**LOWER ABDOMEN**	**5 X 3**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**20**
85	**SHANTAWWA P**	**37**	**F**	**447330**	**01-01-2019**	**C**	**SINGLE**	**LEFT FOREARM**	**3 X 2**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**15**
86	**HARISH BABULAL**	**26**	**M**	**1023**	**16-01-2019**	**C**	**SINGLE**	**RIGHT ARM**	**8 X 5**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**20**
87	**DATTERAYA**	**26**	**M**	**1243**	**20-01-2019**	**C**	**SINGLE**	**RIGHT THIGH**	**5 X4**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**25**
88	**SHANTAMMA L**	**25**	**F**	**2054**	**23-01-2019**	**C**	**SINGLE**	**RIGHT FOREARM**	**4 X 3**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**20**
89	**PARVATI C**	**45**	**F**	**7012**	**05-03-2019**	**C**	**SINGLE**	**RIGHT SHOULDER**	**8 X 4**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**25**
90	**RAVI**	**25**	**M**	**19872**	**22-05-2019**	**C**	**MULTIPLE -2**	**RIGHT FOREARM**	**3X4 , 3X4**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**20**
91	**BASALINGAMMA**	**56**	**F**	**207917**	**23-05-2019**	**C**	**SINGLE**	**RIGHT NECK**	**6 X 3**	**5**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**25**
92	**SANTOSH K**	**27**	**M**	**209016**	**23-05-2019**	**C**	**SINGLE**	**RIGHT FOREARM**	**3 X 3**	**4**	**ABSENT**	**NO**	**NO**	**NO**	**NO**	**NO**	**15**