COMPARISON OF OUTCOME OF EXCISION AND LIPOSUCTION IN HIV TREATMENT INDUCED BUFFALO HUMP PATIENTS OPERATED AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL AND CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfillment of the requirements for the degree of

Master of Medicine

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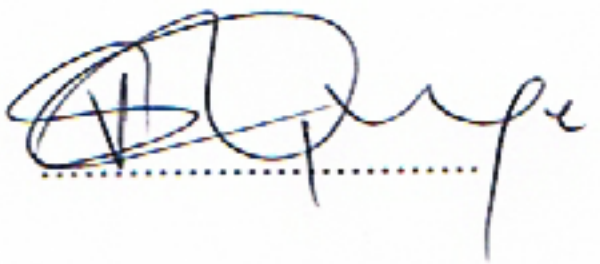
Declaration

I Viwe Nogaga declare that this research report is my own, unaided work. It is being submitted for the Degree of Master of Medicine in the branch of Plastic Surgery at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.



(Signature of candidate)

08 day of November 2021 in MTHATHA

Dedication

This is dedicated to my wife, and my children who endured the pain of not having time with me when pursuing my masters degree.

In loving memory of my grandmother Nobelium Berlina Nogaga (1934 - 2004) who always believed in me.

Presentations and publications arising from the research project

No presentations or publications have resulted from this project yet.

Abstract

Introduction: Buffalo Hump is an abnormal fat distribution in the dorsocervical area. It is commonly cause by side effects of antiretroviral therapy (ART). There are different options described in the literature to treat Buffalo Hump. However, there is no conclusion on a better method in terms of surgical outcomes.

Justification for the study: At the Chris Hani Baragwanath Academic Hospital (CHBAH) and Charlotte Maxeke Johannesburg Academic Hospital (CMJAH), where this study was based, we use excisional or suctional lipectomy depending on the surgeon's discretion. There is no standard method that is used for surgical correction.

Aim: This study seeks to compare the outcomes of excision or liposuction of the buffalo hump induced by HIV treatment to find a better method between the two within our setting.

Methodology: The study is a retrospective analytic study. Data was collected from the files of the thirty-six patients operated at CHBAH and CMJAH form January 2006 to February 2020, which comprises of all the patients that were operated in these two hospitals in this duration. No patient was excluded. A comparison of length of hospital stay, seroma rates and theatre time taken on patients operated upon, were compared.

Results: Of the 36 participants, 28 and 8 were operated on at the CHBAH and CMJAH respectively. Of the total, 80.56% (29/36) were females. The mean age of the participants was 46.17±9.14 years and on average ART exposure was >3 years. Liposuction was the most commonly performed corrective surgery at a rate of 69.44% (25/36) compared to 30.56% (11/36) for excision. Length of hospital stay following excision (4 days) was longer ($p<0.0001$; Mean rank =31) compared to the 2 days reported for liposuction patients. The rate of seroma formation in this population was 5.6% (2/36).

Though no significant difference was observed with seroma formation after both corrective procedures, a 3.8 fold risks was associated with excision at a rate of 18.12% (2/11). No statistical significance was observed in theatre time for both procedures ($p=0.22$)

Conclusion: There were differences in hospital stay and risk of seroma formation after liposuction and excision. The observed differences are critical economically and are in favor of liposuction. More prospective studies are needed to make a decision on more appropriate clinical practice.

Acknowledgements

I wish to express gratitude to the following people:-

My supervisors, Prof, Elias Ndobe and Dr. Pascaline Fru for being patient with me.

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Nomenclature

AIDS	Acquired Immunodeficiency Syndrome
HIV	Human Immunodeficiency Virus
ART	Anti Retro Viral Treatment
HAART	Highly Active Antiretroviral Treatment

CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

Buffalo hump is part of the syndrome of lipodystrophy which is an abnormal fat distribution in the dorsocervical area. It is commonly found on Human Immunodeficiency Virus (HIV) infected individuals who are on anti-retrovirals (ARV's). Buffalo hump is one of the unpleasant disfigurements found in patients diagnosed with lipodystrophy (1). This disfigurement can lead to serious psychological effects and may lead to poor compliance to highly active antiretroviral therapy (HAART) (1). It is very devastating to individuals who are infected with HIV and on HAART as it can serve as a giveaway for HIV infection and treatment. In an advent of HIV/AIDS treatment with HAART, we have seen high incidence of lipodystrophy (2).

Buffalo hump can also be associated with restricted neck movements, neck pain, abnormal posture, insomnia, sleep apnea and dysaesthesia (3). It has been associated with nucleoside analogues such as stavudine and lamivudine (4), with incidence of (0 to 38%) (5). Protease inhibitors are also associated with lipodystrophy with reported rate of (18 to 70%) (6).

Lipodystrophy is clinically characterized by centrally shifting of body fat distribution that is fat wasting from face, buttocks, upper trunk and lower limbs with accumulation of fat in the abdomen or over the cervical spine (7). Lipodystrophy is classified clinically as congenital and acquired. Nine genes associated with lipodystrophy have been identified namely *AGPAT2*, *BSCL2*, *CAV1*, *PTRF* which is associated with congenital generalized lipodystrophy and five other genes, namely *LMNA*, *PPARG*, *ZMPSTE24*, *AKT2* and *CIDEC*, associated with familial partial lipodystrophy (8). Loss of function of these genes can lead to lipodystrophy (8).

Acquired lipodystrophy is also classified as generalized and localized lipodystrophy.

Generalized lipodystrophy is seen in severe insulin resistance, polycystic ovarian syndrome, severe dyslipideamia and fatty liver (9). Acquired partial lipodystrophy is associated with HIV and HAART, C3 nephritic factor, which is an autoantibody involved in formation of several renal diseases for example, C3 glomerulopathy is circulating in most patients with acquired partial lipodystrophy. Lipodystrophy is also associated with different syndromes such as:

1. Dunnigan type familial partial lipodystrophy, which is a rare autosomal dominant inherited disease characterized by central obesity, insulin resistance syndrome, atherosclerosis and hypertension with loss of subcutaneous fat from trunk, gluteal region and extremities (7).

2. Barraquer-Simmons partial lipodystrophy is a rare acquired, progressive form of lipodystrophy which starts affecting the head and spreads to the chest (8).

3. Bereedinelli-Seip Syndrome is an autosomal recessive disease characterized by scarcity of fat in the subcutaneous tissues and muscular hypertrophy (8). There will be accumulation of fat in the liver and skeletal muscles causing hepatomegaly secondary to hepatic steatoria and skeletal muscle hypertrophy (7).

4. Madelung's disease is an acquired condition characterized by subcutaneous, non- tender unencapsulated adipose tissue around the head, neck and upper trunk. The incidence of this disease correlates with alcohol abuse (7).

Different non-surgical therapies have been tried with some of them being unable to give expected results and high recurrence. Diet and exercise will help in maintaining lean body mass but only results in modest improvement of lipodystrophy (10).

Recombinant growth hormone is found to be of value in patients with buffalo hump but its use is limited by cost, side effect profile and the fact that patients are already taking multiple drugs (11).

In our setting we treat buffalo hump surgically with dermalipectomy or suction assisted liposuction. Studies have shown that long term results of both modalities of treatments are favorable (12).

Suction-assisted liposuction of a Buffalo Hump in a Cushingoid patient was reported by Narins (1989) with great success (9), while Ponce-de-Leon et al (1999) first described suction assisted liposuction for HAART related lipodystrophy (13). Liposuction of buffalo hump is reported to be a difficult procedure when inserting a liposuction canulla as this tissue is formed by dense adipose tissue and many fibrous septa. Wolfort at al. (1999) described tumescent liposuction in HIV related buffalo hump (14) while in another study by Coleman and colleagues (1988), the authors reported on the application of tumescent liposuction on non-cosmetic patients (15). In our study group for suction lipectomy, patients were infiltrated with 20 mL 2% lidocaine mixed with one ampule of adrenaline in 1L of ringers lactate. Separation, Aspiration, Fat Equalisation (SAFE) technique was used in our patients (16). Patients were marked and the extent of suctioning outlined before being taken to theatre. Fat separation was done using 3 mm cannula, low pressure used to separate fat globules and mechanically emulsify the fat. This stage allows the release of fibrous septae and blood vessels without causing suction avulsion to the vessels. This process is done till there is loss of resistance in the buffalo hump. Separated fat is then aspirated. This stage is suction driven but there is more preferential target to fat than vascular disruption. Final step is fat equalization and is performed without suctioning. Skin retraction is maximized when SAFE technique is used with superior contouring post liposuction. This stage is mainly for smoothening and contouring the suctioned areas (16).

Studies reported good postoperative results on suction liposuction with recurrence on 5.5% (17).

Surgical lipectomy is another option of correcting buffalo hump with good aesthetic results. Patents were also marked pre- op and the borders of lipectomy outlined. Incision was done in a horizontal manner. Extra dermal tissue was excised in a crescent manner avoiding dog-ear. The incision was sutured using subdermal monocryl 3:0, with suction drain left in situ. All patients were given prophylactic antibiotics.

In a study done by Chen and colleagues in 2019,, clinical outcomes of patient who had undergone surgical lipectomy where evaluated. Twenty two percent of patients developed seroma, which was complicated by infection and wound dehiscence. Patients had on average 22.3±14.3 days of hospitalization, with no recurrence recorded in median follow up at 24 months (range from 2-60 months). The male to female ratio was 2.5 to 1 (18).

At the Chris Hani Baragwanath Academic Hospital (CHBAH) and Charlotte Maxeke Johannesburg Academic Hospital (CMJAH), where this study was based, we use excisional or suctional lipectomy depending on the surgeons discretion for managing the buffalo hump. Considering that there is no standard method used for this surgical correction by the surgeons in these units, identifying the method with a better outcome is important in this setting. This brings us to the study aims and objective.

Study Aim

The aim of this study is to compare the outcomes of excision and liposuction of the buffalo hump induced by HIV treatment.

Study Objectives

1) To compare length of hospital stay on patients who were managed with excision to those who underwent liposuction due to HIV treatment induced buffalo hump.

2) To compare seroma rate on excision to that of liposuction in HIV treatment-induced buffalo hump.

3) To compare the theatre time taken to perform a liposuction to that of excision in an HIV treatment-induced buffalo hump.

CHAPTER 2

METHODOLOGY

1. Research Design

The study was a retrospective analytic study.

2. Materials and Methods

Ethical approval for conducting this study was provided by Human Research Ethics Committee (HREC) Medical of the University of Witwatersrand, ethics number M200759 (see Appendix B for the certificate). Permission to conduct the study was obtained from Chris Hani Baragwanath Academic Hospital and Charlotte Maxeke Johannesburg Hospital (Appendix C).

Theatre books and patient files were reviewed of all patients operated at the Plastic Surgery Units of CHBAH and CMJAH for buffalo hump excision or liposuction and who were on HAART between January 2016 to March 2020 were included in the study. No patients qualified to be excluded. In total, the files and theatre notes of 36 patients reviewed. The sample was collected by convenience. Patients with a CD4 count of less than 200 cells/mm^3, those who were malnourished with albumin of less than 30 g/liter, and patients with other co-morbidities and children less than 18 years of age were excluded from the study. The self-designed data collection sheet (Appendix A) was used to collate all data needed for the study.

3. Data Analysis

All data was captured into a Microsoft Excel spreadsheet and exported into Statistical Package for Social- Science (SPSS) version 22.0 for windows (IBM SPSS Inc, Chicago, IL, USA) for analysis.

General characteristics including age, gender, duration of HAART regimen, and procedure carried out were collected and are described. Only univariate (descriptive) and bivariate (comparison) analysis were conducted. No multivariate analysis was performed. The continuous variables were expressed as mean ±standard error (SE) if normally distributed. If skewed, they were expressed as median and interquartile range (IQR).

Variability between variables for example gender, and age, was estimated using Wilcoxon Rank Sum Test and illustrated using the Box and Whisker plots. Categorical variables were characterised using frequency (n), proportion (%) and 95% confidence interval of proportions. The results are presented using tables and figures.

Objective 1:

The comparison of length of hospital stay following the two surgical procedures was done using the Mann-Whitney U test because it was used not normally distributed. The comparisons are expressed as median, IQR, and sum of ranks between the two groups. A significant variation between the two groups was considered if p-value is less than 0.05. The results were presented in Tables.

Objective 2:

A categorical variable is obtained for this objective. The variable is a dichotomous variable labelled “seroma formed” and “seroma not formed”. Since the study intends to compare the formation of seroma following excision and liposuction (2-groups), Pearson’s Chi-square is used estimate the proportion between the two groups. Significant association between the independent variables (surgical procedure) and dependent variables (outcome of interest – seroma formed/seroma not formed) were computed by Relative Risk (RR) for Cohort design and 95%CI using contingency tables and Chi square test.

The results are presented as frequency (n), proportions (%), relative risk (RR), 95% confidence interval (CI) of RR, and p-values. If p-value is less than 0.05, then the two study groups differ significantly from each other in terms of seroma formation.

If RR is less than 1 for cohort seroma formed, then it is less likely for excision (event in the numerator) to results to seroma formation. If RR greater than 1 for seroma not formed, then the risk of having no seroma is very high following excision.

The proportions of seroma complications between groups (Excision and Liposuction) is compared using Fisher's Exact test if only two complications or Chi-Square if more than two complications.

Objective 3:

The comparison of theatre time for the two surgical procedures was done using the Wilcoxon Rank-Sum test because it was not normally distributed. The comparisons was expressed as median, IQR, and sum of ranks between the two groups. A significant variation between the two groups was considered if p-value is less than 0.05. The results were presented in Tables.

CHAPTER 3

RESULTS

1. Introduction

Liposuction and excision surgical procedures were performed for thirty-six (n=36) participants during the period January 2016 to March 2020 at a ratio of 2.3:1. Twenty-eight of the procedures were performed at CHBAH and eight at CMJAH.

2. General Characteristics of the study population

Gender

Most (n=29; 80.56% CI 63.51% - 90.79%) of the participants were females and only a few (n= 7; 19.44% CI 9.21% - 36.49%) were males (Figure 1) at a ratio of 2.6:1.

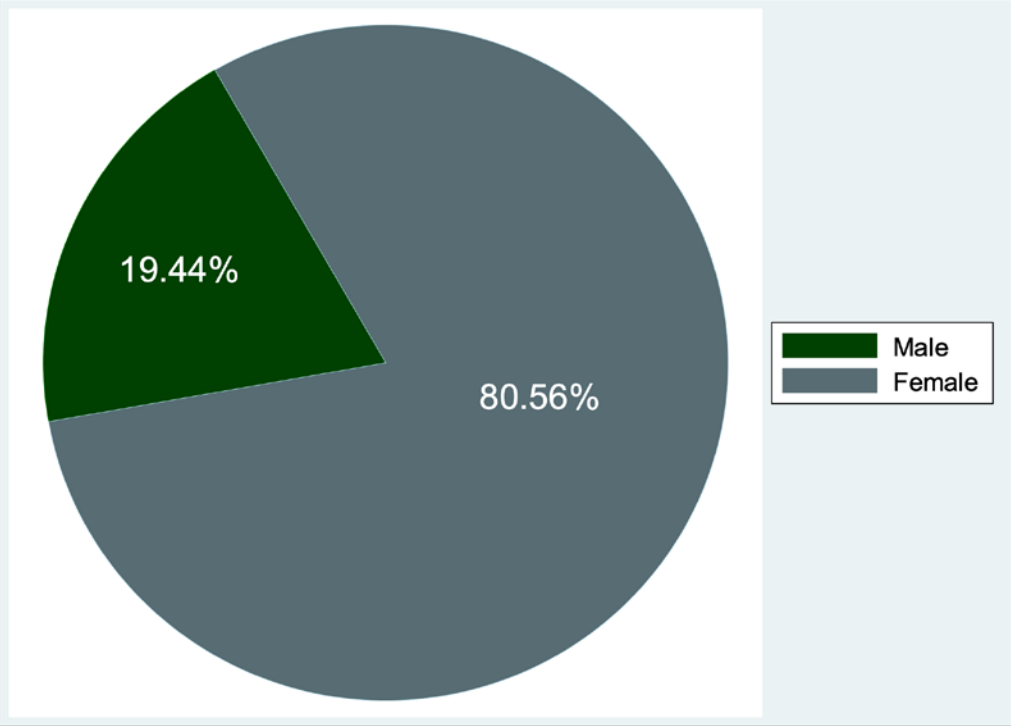

Figure 1: Gender profile of the study population.

Age

Most of the study participants were in their fourth cycle (mean age = 46.17±9.14 years) of life. The youngest participant was 29 years and the oldest 69 years. The age profile is illustrated in Figure 2.

Figure 2: Age profile of the study population.

Although males (median age= 45 years IQR= 42-63 years) were older than females (median age= 43 years IQR= 39-50 years), as illustrated in Figure 3, the age difference between the two was not statistically significant (*Mann-Whitney U-test p=0.50*).

Figure 3: Bar graph of Age by Gender.

Duration on ART before the procedure

The average duration of the study population of the patients on ART before the procedure was 43.22±6.54 months (> 3years, n=36). The minimum duration on ART was 33 months while the longest duration was 63 months (Figure 4).

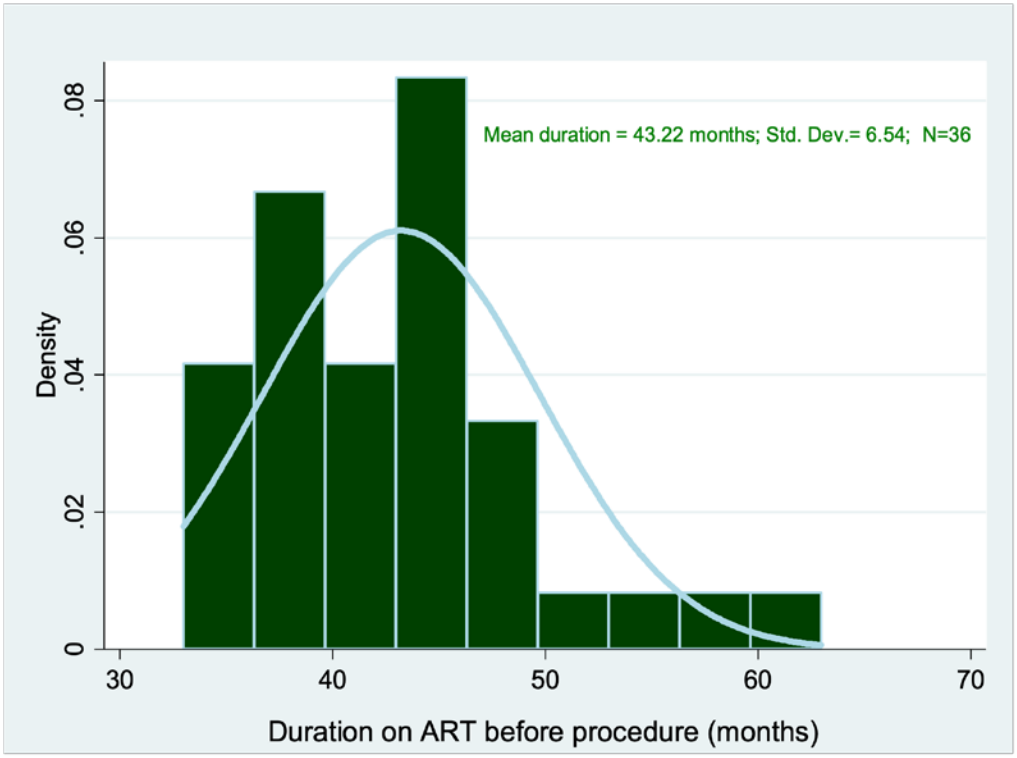

Figure 4: Duration of ART before the procedure.

Procedure carried out

The number of participants who underwent liposuction were 25 (69.44% CI: 51.90% - 82.72%) and the remaining participants (30.56% CI: 17.28% - 48.10%) underwent excision (Figure 5).

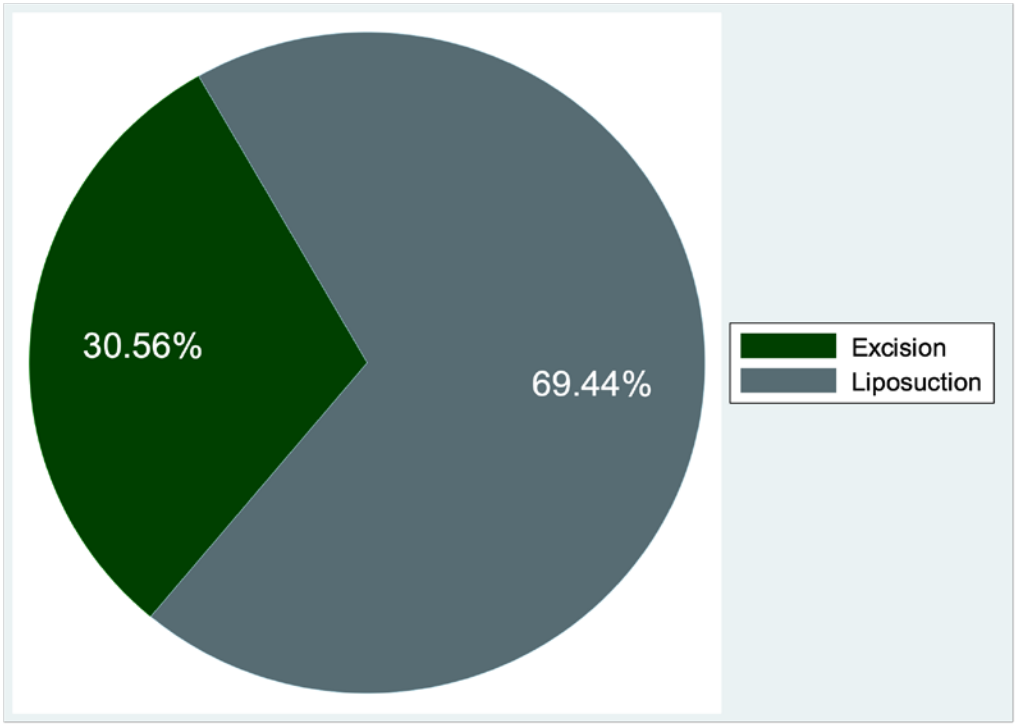

Figure 5: Proportion of participants who underwent Excision and Liposuction.

The participants who underwent excision were older (mean age = 48.36 years) than the ones who underwent liposuction (Table 1). These participants also had been on ART for a longer duration (mean ART duration = 44.27 months) before the procedure compared to the liposuction group. However, the observed differences in age and duration on ART were not statistically significant (*p>005*). On the other hand, gender differentials show that a significantly (*p= 0.018*) high proportion of females underwent both excision (54.5%) and liposuction (92.0%) than males. However, more males had excision (71.4% n=5/7) compared to liposuction (28.6% n=2/7) while more females had liposuction (79.3% n=23/29) compared to excision (20.7% n=6/29). Although the majority of excision and liposuction were performed at CHBAH than at CMJAH, the observed difference in proportions were not statistically significant (*p>0.05*).

Table 1: Comparison of Demographic characteristics across the liposuction and excision population

Variables of Interest	All n=36 Mean ± SE	Excision n=11 Mean ± SE	Liposuction n=25 Mean ± SE	P-value
Age (years)	46.17 ± 1.52	48.36 ±3.84	45.20 ±1.43	0.46
Duration on ART (months)	43.22 ± 1.09	44.27 ± 2.64	42.76 ± 1.09	0.60
	n (%)	n (%)	n (%)	
Gender				
Male	7 (19.4)	5 (45.5)	2 (8.0)	0.018
Female	29 (80.6)	6 (54.5)	23 (92.0)	
Health facility				
CHBAH	28 (77.8)	8 (72.7)	20 (80.0)	0.47
CMJAH	8 (22.2)	3 (27.3)	5 (20.0)	

3. Length of Hospital Stay

Hospital stay in the excision group was statistically significantly longer (Mann-Whitney U = 102; $p<0.0001$) than in the liposuction group (Table 2).

Table 2: Duration of hospital stay after excision and liposuction

Dependent variable	Independent variable	Median (IQR)	Mean Rank	P-value
Hospital stay (days)	Excision n=11	4 (4-6)	31	0.0001
	Liposuction n= 25	2 (2-2)	13	

1. Seroma Rate

A seroma rate of 5.56 % (n=2/36) was observed in the study population. Both participants who developed seroma had excision (rate within= 18.18% n=2/11) and were females. The results further revealed that excision was also more likely to results in seroma formation compared to liposuction with a relative risk (RR) of 3.8. Despite these observed differences in rates and risk of seroma formation between excision and liposuction, statistically the differences were not significant (*p=0.087*).

Table 3: Seroma rate following excision and liposuction

Dependent variables	All n=36 n (%)	Excision n=11 n (%)	Liposuction n=25 n (%)	RR (95%CI)	P-value
Seroma formed	2 (5.56)	2 (100)	0 (0.0)	3.8 (2.1-6.6)	0.087
Seroma not formed	34 (94.44)	9 (26.5)	25 (73.5)		

The one (n=1/36; 2.78%) participant who developed a complication (wound breakdown) had undergone an excision and was a male. Wound breakdown was not associated with seroma formation but occurred as a standalone complication. No other complications were reported.

Table 4: Complications of excision and liposuction

Complications	All n=36 n (%)	Excision n=11 n (%)	Liposuction n=25 n (%)	RR (95%CI)	p-value
Wound breakdown	1 (2.78)	1(100)	0 (0.0)	3.5 (2.1-5.9)	0.31
None	35 (97.22)	10 (28.6)	25 (71.4)		

2. Theatre Time

It took a longer theatre time (median of 105 minutes) to complete excision compared to liposuction (median of 90 minutes). Statically, the reported differences in theatre time were not significant (*p=0.22*). Meaning the time taken to complete the two procedures were similar.

Table 5: Comparison of the time taken to complete excision and liposuction

Dependent variable	Independent variable	Median (IQR)	Mean Ranks	P-value
Theatre time (minutes)	Excision n=11	105 (70-180)	21.73	0.22
	Liposuction n= 25	90 (77.50-103.50)	17.08	

CHAPTER 4

DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

1. Discussion

Excisional and suctional lipectomy are two surgical methods currently used at CHBAH and CMJAH to correct buffalo hump induced by ART in HIV-infected patients. The use of either of these procedures is not based on clinical evidence but on the surgeon's preferences since reports have shown pros and cons for using either method in other settings. In a 2019 study in China by Chen and colleagues (2019) recommended the use of excisional lipectomy due to the difficulty encountered in passing the lipoplasty cannulas during liposuction (18). Yet in another study by Collins (2003), the author noted that liposuction be considered a preferred method due to the minimal scarring (19). In their 2008 study, Warren and colleagues concluded that due to high rates of recurrence with liposuction, excision with or without liposuction could provide better results and superior long-term outcomes (21). According to Chen et al. (2019) liposuction should be used as an added treatment to excision for better contouring of the periphery when the fat pad is more than 10 cm (18).

However, no studies have identified which of the surgical option is superior to the other especially with respect to outcomes. This study is the first to compare outcomes of liposuction and excision. Most of the previous studies only describe the outcomes of excision or liposuction to affirm their usefulness in correcting buffalo hump. This study aimed to compare these two treatment modalities by looking at the outcomes to ascertain which method is a better option in a South African setting. The outcomes that were measured to decide on superiority were length of hospital stay, seroma rates, and theatre time at the study settings.

Thirty-six (n=36) participants with buffalo hump were treated by means of excision or liposuction at a rate of 30.56% (n=11) to 69.44% (n=25). More participants underwent liposuction than excision, a finding consistent with the literature by Muller Neto et al. (2015) who documented no statistical difference (a rate of 48.1%) for liposuction compared to other corrective surgeries for lipodystrophy including conventional abdominoplasty, gluteoplasty, fat grafting, mastoplasty, submental liposuction, and abdominal, back, or flank liposuction in Brazil (21).

The mean duration of ART was 43.22±6.54 months (longer than 3.7 years) with no difference by treatment group. The occurrence of buffalo hump with a longer duration of ART has been documented in the literature. For example Han et al. (2011) (22) reported that exposure to ART for longer than 3.8 years was significantly associated with a higher occurrence of HIV-associated lipodystrophy. Other studies from China (Chen et al., 2019) (18), India (Kumar et al., 2015)(23), Brazil (Muller Neto et al., 2015) (21), and America (Warren et al., 2008) (20) found a mean duration of ART exposure of 8.8±2.1 years, five years, 12.1 years, and 4.75 years respectively. This shows that buffalo hump developed within a shorter period of ART exposure in the present study population compared to other settings. This might be due to the differences in the prescribed ART regimen in the different settings, but this data was not available for the current study making it difficult to conclude on the findings.

The mean age of the participants was 46.1±9.14 years with no statistical difference in age between males and females and across the two treatment modalities. The age profile reveals the occurrence of this condition mainly with the aging population since most of the study participants were in the second half of the fourth cycle of life. This age group is more aware of the stigma associated with buffalo hump development.

A similar age profile was reported in a Chinese (mean age 47.8±8.0 years), Brazilian (47.2 years), and American (47.2 years) population of HIV treated patients with buffalo hump in studies by Chen and colleagues, in 2019 (18), Muller Neto and colleagues in 2015 (21) and Warren and colleagues in 2008 (20) respectively.

There were more females than males in this study similar to the study populations in the Chinese study (18) where the female to male ratio was 8:1, in a Brazillian study (21) with a female to male rate of 3.5:1. This observation is contrary to that of Warren et al. (2008) who reported a male to female ratio of 6:1 in America (20). The high number of females could be because of the high prevalence rates of HIV and ART coverage among females in South Africa. HIV prevalence rate among females in 2019 was 25.0% compared to 12.9% among males (George et al., 2020) (24). In addition, 75% of HIV infected females in South Africa in 2019 were on ART compared to 63% coverage in male (UNAIDS, 2020) suggesting that many more females than males were more likely to develop buffalo hump (25).

The fact that a significantly high proportion of females underwent both excision and liposuction is in line with the statement in the preceding paragraph, which relates to the high proportion of females on ART and subsequent development of buffalo hump. The findings also reveal that more (71.4%) males had excision while more (79.3%) females had liposuction. In the literature, nearly all of the participants who were treated by excisional lipectomy were females in a Chinese study (18) but males in American study (20). These differences could be attributed to a high propensity of seroma formation after excision in females; as shown in this study where all the participants who developed seroma had an excision and were females.

Perhaps, such outcomes in the day-to-day practice, has resulted in a preference for liposuction for female patients and excision for males patients by the plastic surgeons in the current setting.

The literature on the influence of gender on the outcomes of corrective surgery for lipodystrophy was not available at the time of this write-up.

Length of Hospital stay

The hospital stay was longer after excision compared to liposuction as shown in Table 2. Half of the participants stayed in the hospital for 4 days after excision and two days after liposuction. The hospital days in the present setting are quite short compared to the 23.4±14.3 average hospital days patients had in a Chinese study after excision (Chen et al., 2019) (18). However, the longer duration of hospital stay for patients who received excision compared to those who receive liposuction, shows that participants who underwent excision required more in-patient hospital care than those who had liposuction. The findings from this study support this evidence since complications were only observed with participants who underwent excision. The presence of complications means a continuation of medical care and thus longer stay in hospital. This translates to high bed occupancy rates and more health care expenses for this group of patients. Thus, excision adds to inpatient numbers and is also not cost-effective.

Seroma rates

The rate of seroma formation was 5.6% in the study population. The risk of seroma formation was 3.8 times higher after excision at a rate of 18.18% (n=2/11). This rate is slightly lower than the 22% reported by Chen and colleagues in 2019 (18) and 42.85% (n=3/7) reported by Warren and colleagues in 2008 (20). None of the participants who underwent liposuction developed seroma even though seroma was highlighted by Dhami in 2008 (26) as a postoperative complication of liposuction. The absence of seroma after liposuctions is a favourable outcome and suggests that liposuction is the preferred surgical option to an excision in the current setting.

Although seroma formation often results to wound dehiscence or infection (Chen et al., 2019) (18), it was not the case in our study population. None of the participants who developed seroma presented with other complications.

However, one participant had a wound breakdown directly from excision, which is consistent with the literature by Warren et al. (2008) who also reported that one patient who had wound dehiscence after excisional lipectomy (20).

Theatre time it takes to do liposuction and excision

There was no difference (Table 5) in theatre time taken to do liposuction and excision. It took 105 minutes (median= 105 IQR = 70-180 or 1.8 hours IQR = 1.2-3 hours) to complete excision in half of the participants and 90 minutes (1.5 hours) to complete liposuction. An average, operative time for excision of 2.7 hours (range= 1.0-5.8 hours) was reported by Warren et al., (2008) (20). This shows a shorter theatre time for both surgical modalities in the study setting.

2. Study Recommendations

Based on the results from this study the following recommendation is made:

- Future studies should include a large prospective comparative study with measurements that include demographic features, clinical data, and other efficacy outcomes such as recurrence, cosmetic outcomes, excisional volumes and cost. These studies should also consider identifying predictors of specific outcomes.

3. Study Limitations

The numbers that were operated during the period were not enough to draw national conclusion. Furthermore, the data used in the study for comparing outcomes is only based

on theatre time, seroma rates and hospital stay. Wound complication rates were underreported while excisional volumes, cosmetic outcomes, patient satisfaction, recurrence rates or other follow up information were not considered, as the study is a retrospective study. The data used was based on hospital notes and therefore limits generalization of the study. Another limitation is that the assignment of patients into the two study groups was not randomized but at discretion of the surgeon. Furthermore, seroma was assessed clinically and minimal seroma that didn't need treatment was not recorded. Based on these limitations, we recommend that a prospective study, with bigger numbers is considered in which the stated parameters are considered.

4. Study Implications

The findings of this study put liposuction as a better surgical treatment option for buffalo hump in the present population. Liposuction was associated with shorter length of hospital stay and low risk for seroma formation.

On the other hand, excision was associated with negative outcomes including longer hospital stay and a 3.8 times risk for seroma formation. Therefore, more prospective studies are needed to make a change in clinical practice.

5. Conclusion

There were differences in the outcomes measured in the present study for liposuction and excision corrective surgery. The outcome such as length of hospital stay was only two days after liposuction but longer after excision. With liposuction, the risk of seroma formation was lesser compared to 3.8 folds risk when excision was performed. Even the theatre time though not significantly different was longer (1.7 hours) for excision.

Therefore, observed differences are critical economically and are in favor of liposuction. More prospective studies are needed to make a decision on more appropriate clinical practice.

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Appendices

Appendix A: Data collection sheet

Patient Number	Age	Sex	Theatre Time	Procedure	Hospital stay

Appendix B: Ethics Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research and Postgraduate Affairs

TO:	Dr V Nogaga School of Clinical Medicine Department of Surgery Division of Plastic Surgery Medical School University E-mail: viwenogaga@gmail.com
CC:	Supervisor: Professor E Ndobe and Dr P Fru Pascaline.Fru@wits.ac.za and <HREC-Medical Research Office@wits.ac.za>
FROM:	Mr Iain Burns Human Research Ethics Committee (Medical) Tel: 011 717 1252 E-mail: Iain.Burns@wits.ac.za
DATE:	30 November 2020
REF:	R14/49
PROTOCOL NO:	**M200759** (This is your ethics application reference number. Please quote it in all enquiries, oral or written, relating to this study.)
PROJECT TITLE:	*Comparison of outcome of excision and liposuction in HIV treatment-induced buffalo hump patients operated on at Chris Hani Baragwanth Academic Hospital and Charlotte Maxeke Johannesburg Academic Hospital*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

R14/49 Dr V Nogaga

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M200759

NAME: (Principal Investigator)	Dr V Nogaga
DEPARTMENT:	School of Clinical Medicine Department of Surgery Division of Plastic Surgery Medical School University
PROJECT TITLE:	Comparison of outcome of excision and liposuction in HIV treatment-induced buffalo hump patients operated on at Chris Hani Baragwanth Academic Hospital and Charlotte Maxeke Johannesburg Academic Hospital
DATE CONSIDERED:	31 July 2020
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Professor E Ndobe and Dr P Fru
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	30 November 2020

This clearance certificate is valid for 5 years from the date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **July** and will therefore reports and re-certification will be due early in the month of **July** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

Date

Appendix C: CEO Permission Letters

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

MEDICAL ADVISORY COMMITTEE

CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

PERMISSION TO CONDUCT RESEARCH

Date: 17th June 2020

TITLE OF PROJECT:

Comparison of outcome of excision and liposuction in HIV treatment induced buffalo hump patietns operated at Chris Hani Baragwanath Academic Hospital and Charlotte Maxeke Johannesburg Academic Hospital.

UNIVERSITY: Witswatersrand

Principal Investigator: Dr V Nogaga

Department: Plastic and Reconstructive Surgery

Supervisor : Prof E. Ndobe and Dr P Fru

Permission Head Department (where research conducted): Yes

The Medical Advisory Committee recommends that the said research be conducted at Chris Hani Baragwanath Academic Hospital. The CEO / management of Chris Hani Baragwanath Academic Hospital is accordingly informed and the study is subject to:-

- **Permission having been granted by the Committee for Research on Human Subjects of the University of the Witwatersrand.**
- The Hospital will not incur extra costs as a result of the research being conducted on its patients within the hospital
- The MAC will be informed of any serious adverse events as soon as they occur
- Permission is granted for the duration of the Ethics Committee Approval.

Recommended
(On behalf of the MAC)
Date: 17/06/2020

Approved/Not Approved
Hospital Management
Date: 24/08/2020

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL

Enquiries:
Ms. X Dhlamini
Office of the Clinical Director
Email: xolisane.dhlamini@gauteng.gov.za
Tel: (011): 488-3710
03 June 2020

Dear Dr, V Nogaga

STUDY TITLE: Comparison of Outcome of Excision and Liposuction in HIV treatment Induced Buffalo Hump patients operated at Chris Baragwanath Academic Hospital and Charlotte Maxeke Johannesburg Academic Hospital

Permission to conduct the above-mentioned study is provisionally approved. Your study can only commence once Ethics approval is obtained. Please forward a copy of your Ethics Clearance Certificate as soon as the study is approved by the Ethics Committee for the CEO's office to give you the final approval to conduct the study.

Supported / not supported

Dr. PN Africa
Acting Clinical Director
DATE: 03/06/2020

Approved / not approved

Ms. G. Bogoshi
Chief Executive Officer
DATE: 05.06.2020

Appendix D: Plagiarism/Turn-It-In Report Cover Page