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Review Article

Bariatric Surgery in Patients Living With HIV: a Literature Review

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Abstract

Obesity remains a significant public health issue due to its association with an elevated risk of cardiovascular disease, metabolic disorders, certain types of cancers, and other health conditions [1]. According to the Centers for Disease Control and Prevention (CDC) estimates from 2011 to 2014, approximately 37% of the adult population and 17% of the youth population in the United States were classified as obese [2, 3]. In 2017-2018 survey by National Health and Nutrition Examination Survey (NHANES), it is found that over 42.4% of adults in USA were obese [4]. Interestingly, obesity trends in the general population are comparable to obesity trends in patients living with HIV (PLWH) [5]. Classically, HIV used to be considered a wasting disease and a fatal condition. However, the advancements made in treating HIV with highly active antiretroviral treatment (HAART) have transformed HIV into a chronic condition rather than a fatal one [6]. Despite the introduction of HAART, HIV remains a major health concern, with the CDC estimating a prevalence of around 1.2 million [7]. Furthermore, HAART, mainly protease inhibitors, has been associated with weight gain, redistribution of body fat, dyslipidemia, and other metabolic disorders [8].

Keywords: HIV; CDC; NHANES; HAART

Introduction

Background Information:

Obesity remains a significant public health issue due to its association with an elevated risk of cardiovascular disease, metabolic disorders, certain types of cancers, and other health conditions [1]. According to the Centers for Disease Control and Prevention (CDC) estimates from 2011 to 2014, approximately 37% of the adult population and 17% of the youth population in the United States were classified as obese [2, 3]. In 2017-2018 survey by National Health and Nutrition Examination Survey (NHANES), it is found that over 42.4% of adults in USA were obese [4]. Interestingly, obesity trends in the general population are comparable to obesity trends in patients living with HIV (PLWH) [5]. Classically, HIV used to be considered a wasting disease and a fatal condition. However, the advancements made in treating HIV with highly active antiretroviral treatment (HAART) have transformed HIV into a chronic condition rather than a fatal one [6]. Despite the introduction of HAART, HIV remains a major health concern, with the CDC estimating a prevalence of around 1.2 million [7]. Furthermore, HAART, mainly protease inhibitors, has been associated with weight gain, redistribution of body fat, dyslipidemia, and other metabolic disorders [8].

Since HAART was introduced and HIV transitioned into a chronic state, there has been a notable rise in the incidence of obesity and metabolic disorders among PLWH [6]. Furthermore, PLWH is at higher risk of increasing body fat mass at all ages than the general population [9]. It is estimated that about 19% of HIV-infected men and 42% of HIV-infected

women receiving medical care are diagnosed with obesity [10]. Notably, in PLWH, being overweight is twice as likely as being underweight [11].

Bariatric surgery has proven to be the most effective treatment for morbid obesity in the general population [12]. While the safety and efficacy of bariatric surgery are well-established in the general population, its safety in PLWH is still being investigated. One of the primary concerns is the effect of bariatric surgery on the absorption of HAART due to alteration of the gastrointestinal tract anatomy [3, 13]. Moreover, until recently, insurance providers considered HIV a terminal illness and may not cover the procedure, and the perceived risk of infection by surgeons contributed to their hesitancy in performing bariatric surgery on PLWH [14]. Consequently, a combination of these factors, along with limited data on clinical outcomes, has resulted in lower rates of bariatric surgery among PLWH compared to the general population [3].

In this paper, we examine the existing literature addressing bariatric surgery in PLWH.

Methods:

A PubMed search was employed to retrieve related articles in April of 2023. Using the search queries "(bariatric surgery) AND (HIV)" in PubMed revealed 94 papers; no filters were applied.

After reviewing the abstracts for all 94 articles, we found 27 papers that are relevant to the topic of discussion. The remaining articles discuss irrelevant topics that are mostly associated with protease inhibitor-induced lipodystrophy treatment using modalities surgery.

Data about the number of patients, type of procedure (Table 1), postoperative complications, and post-operative HAART pharmacokinetics are collected and summarized below.

Results:

Out of the 27 publications (Table 2), 4 publications are literature review articles. Two of these 4 articles focus on bariatric surgery's effects on antiretroviral pharmacokinetics [15, 16]. Out of the remaining 23 articles, 15 publications discuss the outcomes of bariatric surgery in PLWH in terms of its impact on CD4+ T-cell count, viral load, and post-surgical complications, among other aspects. The remaining 7 articles discuss the impact of bariatric surgery on the pharmacokinetics of specific HAART. The majority of the pertinent literature was case reports or retrospective cases series while only 2 were prospective, and one retrospective case control.

Tow publications used the United States Nationwide Inpatient Sample database from 2004 to 2014 [3, 17]. Both studies identified the same 346 PLWH who underwent bariatric surgery. The primary outcome for both studies was in hospital mortality in PLWH who underwent bariatric surgery. Both studies have found that bariatric surgery in PLWH did not influence in-hospital mortality. Sharma et al. reported a significantly lower risk of renal failure, respiratory failure, and sepsis in obese PLWH who had bariatric surgery compared to obese PLWH who did not have weight loss procedures [17]. Furthermore, McCart et al. found no significant association between HIV and wound infection, myocardial infarction, or other postsurgical complications in PLWH who underwent bariatric surgery compared to HIV-negative patients who underwent bariatric surgery [3].

The remaining 22 papers included 154 cases of PLWH who had bariatric surgery. 105 of those patients had gastric sleeve (GS), 25 had gastric bypass (RYGB), 12 patients had either GS or RYGB that were not subclassified, and 4 patients had adjustable gastric band. In 7 cases, the type of bariatric surgery procedure is not reported. The surgical techniques varied between laparoscopic, endoscopic, and open laparotomy.

Pourcher et al. reported that their prospective study was the largest prospective study focusing on bariatric surgery in PLWH at the time of publication in 2017 [18]. The study included 10 PLWH who had SG, with median postoperative follow up of 18 months. Weight loss was successfully achieved, while viral suppression was maintained, and no statistically significant change in CD4 count after SG was noted in all 10 patients. Furthermore, all obesity-associated comorbidities (diabetes, dyslipidemia, sleep apnea, and hypertension) resolved, and their associated medications were withdrawn after SG. Only three complications were reported in this perioperative study, which were SG leak, bowel obstruction, and incisional hernia. The first two complications occurred in a patient with a history of liver transplant who was on immunosuppressants [18].

Shortly after in 2018, another prospective study including 17 cases of PLWH who had SG was published. The mean follow-up time for this study was 2 years [14]. In terms of weight loss after SG, Amouyal et al reported similar outcomes as Pourcher et al. Unlike the previously mentioned prospective study, not all 17 patients maintained viral suppression. 12 patients maintained viral suppression without a need to change their HAART, 4 patients had detectable viral load with subsequent viral suppression after changing their ART, and one patient with persistent detectable viral load despite HAART modification. Furthermore, Amouyal et al. reported improvements in the same obesity-associated comorbidities reported by Pourcher et al. However, Amouyal et al reported different postsurgical complications; specifically, two cases of dysphagia with no positive findings on GI imaging, one case of gastric ulcer with successful management using proton pump inhibitors, and one case of myocardial infarction with successful medical management that the authors claim to be not related to the surgery [18, 19].

Both studies report the pharmacokinetics of certain HART after SG. Pourcher et al. reported that the trough plasma concentration of abacavir, emtricitabine, lamivudine, tenofovir, ritonavir, atazanavir, darunavir, dolutegravir, raltegravir, nevirapine, and ilpivirine were all within the accepted therapeutic ranges [18]. Amouyal et al. reports that the plasma concentrations of abacavir, atazanavir, efavirenz, emtricitabine, lamivudine, darunavir, ritonavir, and tenofovir were consistent with therapeutic ranges reported in the literature. However, both raltegravir and atazanavir showed different results. Raltegravir showed variability between

different individuals and dropped below therapeutic ranges in some of their study population post-SG. Atazanavir plasma levels were also below the therapeutic range which is consistent with another study [18-20]

Another study reports that darunavir, emtricitabine, and tenofovir plasma levels were within the therapeutic ranges in 4 PLWH who underwent gastric bypass [21]. On the other hand, an assessment of plasma levels of Lamivudine/Zidovudine and Lopinavir/Ritonavir in a 24-year-old HIV+ pregnant female who underwent gastric bypass indicated that the plasma levels of these HAARTs were below the recommended therapeutic range [22].

Few complications have been reported after bariatric surgery in PLWH. Besides the high rates of post-operative stricture reported by Sharma et., no other study reports a significant risk associated with bariatric surgery in PLWH. Marginal ulcer, anastomotic stricture, hernia, infection, stenosis of the gastrojejunostomy, and infected band and port were among the few complications reported [20, 23, 24]. Furthermore, Poucher et al. reported that all comorbidities-specific medications were discontinued in their study cohort after bariatric surgery [18]. In another study, all seven diabetic patients were reported to discontinue their diabetic medication within 6 months after bariatric surgery [26]. Sharma et al. reported no significant differences in percent weight loss, major postoperative complications, or mortality rates between HIV+ and HIV- patients after bariatric surgery. Additionally, renal failure, respiratory failure, and sepsis rates were found to be lower in HIV+ who underwent bariatric surgery[17].

Type of Procedure	Total Number of Patients
Sleeve Gastrectomy	30
Gastric Bypass	105
Unspecified	19
Total	154

Table 1: Summary of different types of procedure reported in the reviewed articles.

Study Type	**Number of Articles**
Literature Review	4
Prospective	2
Case Reports/Series	21
Total	**27**

Table 2: Summary of different types of articles reviewed.

Discussion:

The long-term implications of bariatric surgery in PLWH are still under investigation. Bariatric surgery was not traditionally recommended for PLWH until recently [18]. However, with the growing body of literature that supports the safety and efficacy of bariatric surgery in PLWH, there has been a significant increase in rates of bariatric surgery in this patient population. The number of bariatric procedures performed on PLWH was 6.3 times higher in 2014 (76 cases) than in 2004 (only 14 cases) [17].

While there is a suggestion in the literature that mild to moderate obesity may be linked to a higher CD4 count and prolonged survival rates compared to lean body mass [25], the evidence remains controversial, with conflicting findings. Crum-Cianflone et al. observed a negative correlation between higher BMI and CD4 count following the initiation of HAART [26]. In addition to the association between metabolic disorders and shorter survival in PLWH, some studies suggested that adipose tissue may serve as a reservoir for the virus [7, 19, 27]. On the contrary, Shor et al. argue that mild to moderate obesity may be associated with better survival in PLWH [25]. In our review of literature on PLWH who achieved weight loss after bariatric surgery, it appears that bariatric surgery and weight loss have no significant impact on viral load or CD4+ cell count. Additionally, current literature supports the notion that addressing morbid obesity in PLWH contributes to the improvement of obesity-related comorbidities, which improves survival in PLWH [27, 28].

It is not clear whether SG or RYGB has better outcomes in PLWH compared to each other. Kassir et al. suggest that SG may be a better option based on the findings from Poucher et al. findings [29]. Furthermore, another study by El Kamari et al. found no statistical significance in CD4+ T cells after either procedure; however, RYGB was associated with better long-term outcomes including maintained weight loss and no progression of obesity comorbid conditions in 2 year follow-up period [30]. Additionally, in their SG cohort, there was an increased viral load in three of the subjects taking atazanavir or dolutegravir based HAART regimen [30]. It was not reported if any of the patients who underwent RYGB were on similar HAART regimen, and there is no sufficient evidence in the literature comparing alteration of HAART absorption in either procedure. The question of which procedure is superior in PLWH still remains unanswered based on available literature.

Additionally, whether pharmacological treatment or bariatric surgery for obesity in PLWH is still under investigation. A growth hormone-releasing factor analog, tesamorelin, is found to improve the metabolic profile and decrease abdominal fat but has no effect on body weight [31]. The emergence of anti-obesity medicine is changing the landscape of treating obesity. However, there is a lack of long-term data regarding the pros and cons of these medications. Especially drug-drug interaction in HAART should proceed with caution in this population. In a case report, Liraglutide, a GLP-1 agonist was associated with 16 kg weight loss in a patient with type II debates and HIV [32]. The use of GLP-1 agonists for obesity management in PLWH has not been well studied yet after recent approval for obesity management in the general population. In one study, there was no significant drug-drug interaction between GLP-1 and HAART; however, there is a concern about using GLP-1 agonists with HAARTs that requires low gastric acidity such as atazanavir [33]. Additionally, there is a lack of literature comparing the effectiveness of medical therapy and bariatric surgery for obesity in PLWH. In currently available literature, bariatric surgery appears to be superior to medical therapy in obesity treatment [34, 35].

Conclusion:

The growing body of literature supports the safety and effectiveness of bariatric surgery in PLWH. Nonetheless, further larger studies are warranted to explore the long-term effects of bariatric surgery in this population. Given the gastrointestinal anatomical modifications associated with bariatric surgery and their potential influence on the absorption of HAART, additional research is needed to better understand the impact on maintaining therapeutic levels of these medications. The comparative long-term efficacy between SG and RYGB remains unresolved. Moreover, there is a need for more extensive research to evaluate the advantages of available medical therapies compared to bariatric surgery in managing obesity in PLWH.

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