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Original article

Bariatric surgery in young adults: a multicenter study into weight loss, dietary adherence, and quality of life

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Abstract

Background: Numerous studies have demonstrated that bariatric surgery is an effective intervention for morbid obesity, but study samples are characterized by an underrepresentation of young adult patients.
Objectives: The aim of this study was to evaluate weight loss, dietary adherence, and quality of life (QoL) in a multicenter, young adult sample, in the first 6 years after bariatric surgery.
Setting: Four general hospitals in the Netherlands.
Methods: A total of 184 young adult patients who underwent bariatric surgery between 6 and 74 months previously at the age of 18 to 24 years were included, interviewed by phone, and sent questionnaires assessing postoperative weight, QoL, and lifestyle behaviors including dietary adherence. Complete data were available for those 96 patients who returned the questionnaires.
Results: Mean percent weight loss was 30.2 (SD 10.7) for laparoscopic sleeve gastrectomy and 35.6 (SD 6.9) for laparoscopic Roux-en-Y gastric bypass. Adherence to postoperative dietary recommendations declined over the years ($r = –.25$, $P = .02$) and explained 8.3% of the variance in weight loss ($r = .29$, $P = .005$). QoL scores lagged behind national norms for young adults and were largely unrelated to weight loss. A quarter of patients (25%) turned out to be not in education, employment, or training and 38% had used mental healthcare services since surgery, which occurred independent of weight loss and concurred with poorer QoL.
Conclusion: Young adult patients achieve weight loss comparable to adult patients after bariatric surgery. However, postoperative adherence to behavioral recommendations and psychosocial functioning clearly demonstrate room for improvement and require adjunctive interventions. (Surg Obes Relat Dis 2017;▮:00–00.)

Keywords: Bariatric surgery; Gastric bypass; Sleeve gastrectomy; Young adults; Weight loss; Quality of life; Psychosocial functioning; Dietary adherence

Bariatric surgery has proven to be an effective intervention for morbid obesity [1], with patients loosing around 30% of their total weight [2]. Over the past decade, there has been an increase in the use of bariatric surgery in adolescents and young adults [3,4]. In adolescents, bariatric surgery has been shown to produce favorable results [5]. For young adults, outcomes are as yet unclear because adult study samples are characterized by an underrepresentation of young adult patients. Studies that included young adults along with adolescents [4,6,7] are characterized by small sample sizes and short follow-up periods of 12 to 24 months. A recent Cochrane review [1] points to the lack of evidence on the effectiveness of bariatric surgery in

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younger adults and argues for more studies in this age group.

In addition, there is a need for a better understanding of determinants of individual differences in weight loss. Although weight loss is generally substantial in bariatric surgery patients, an estimated 20% of patients show less improvement postoperatively [8]. In the search for possible predictors of weight loss after surgery, adherence to postsurgery behavioral recommendations emerged as factor of significance [9,10]. In younger patients, adherence to behavioral guidelines may be of special importance. Bariatric surgery can be viewed as "forced behavior modification" during the first postoperative years, but over the long run, the patient's ability to voluntarily comply with a dietary regimen becomes crucial in maintaining weight loss [11,12]. This might prove challenging in the turbulent young adult life stage. Indeed, younger age predicts poor attendance to follow-up care [13], and young adults' compliance with clinical follow-up care already decreases in the first 2 postoperative years [14].

Although weight loss and health gains are primary objectives of bariatric surgery, improving quality of life (QoL) and psychosocial functioning is an important secondary aim. Young adults with obesity have been shown to have reduced physical [15] and mental [16] QoL, reduced educational attainment, decreased earning potential, and greater likelihood to stay single [17]. As these patients develop into the adult life stage, bariatric surgery should ideally steer QoL in a more positive direction, toward more fulfilling levels of functioning. The present study will examine weight loss in a multicenter young adult sample, up to 6 years after bariatric surgery. Dietary adherence following surgery will be evaluated as a possible predictor of weight loss. In addition to examining weight loss as an outcome measure, QoL and psychosocial functioning following surgery will also be assessed.

Methods

A multicenter, cross-sectional study was conducted from September 2014 to March 2016. Four hospitals in the Netherlands participated in the study. Permission to conduct the study was obtained from the local institutional review boards. The study population consisted of all patients who underwent bariatric surgery at the age of 18 to 24 years in one of the participating hospitals in the past 6 years. Patients who underwent surgery <6 months previously were excluded, as were patients who underwent revisional surgery. The age range was selected in accordance with age range criteria for young adulthood as employed by both Dutch and U.S. federal statistical agencies [18].

Patients were first informed in writing about the study and were then approached by phone to solicit their participation. Five attempts were made to reach patients by phone. Upon agreement to participate, data on height and preoperative weight were collected from the patient's medical record. Each participant was then scheduled for a structured interview by phone and sent questionnaires by post. Written informed consent was obtained from all participants included in the study.

Measurements

By means of a structured interview by phone, data were collected on satisfaction with the results of surgery (scale 1–10), complications after surgery, follow-up care, medical and mental healthcare consumption since surgery, self-rated QoL (scale 1–10), stressors since surgery, alcohol consumption, relationship status (having a partner/not having a partner), and education/employment status (being in education or employment/not being in education or employment). With regard to patients' relationship status, comparisons were made with figures from a population study among young adults [19]. With regard to patients' education/employment status, comparisons were made with figures on the number of young adults not in education employment or training (NEET) in the general population [20]. The NEET indicator is measured regularly in population studies as an indicator of the transition from education to work and of youth unemployment [20].

A self-composed lifestyle questionnaire, based on a questionnaire in use nationally for screening patients for bariatric surgery, was used to establish patients' dietary and exercise habits. Questions focus on adherence to dietary guidelines (scale 1–10), frequency of eating fatty and high-caloric meals, amount of exercise per day, and TV/computer time per day. Regarding adherence to dietary guidelines, the cut-off score for discriminating sufficient from insufficient adherence was set at 6, in line with the Dutch grading system in education.

QoL was assessed using the Dutch version [21] of the Short Form Health Survey (SF-36) [22]. This instrument measures QoL and daily functioning, based on the World Health Organization definition of health that focuses on 3 dimensions: physical, mental, and social health. Support for the reliability and validity of the SF-36 has been documented for both the English version [23,24] and the Dutch version [21]. The SF-36 consists of 8 scales: physical functioning, physical role functioning, bodily pain, general health, vitality, social role functioning, emotional role functioning, and mental health. Responses on each scale are transformed to scores ranging from 0 to 100, with a higher score indicating better health status. Patients' QoL scores were compared to both national [21] and US norms [25].

To determine postoperative weight, participants received a form with instructions how to measure their weight at home (during daytime, with clothes, without shoes). Although trends of underreporting weight in studies using

self-report measures have been documented [26], self-reported weight appears to be relatively valid in younger adults [27]. In a bariatric surgery sample, self-reported weights proved to be close to measured weights [28]. Change in body mass index (BMI), percent excess weight loss, and percent total weight loss were calculated to enable comparison with other studies, but for statistical analysis percent total weight loss was used as weight loss measure, as recommended by Van de Laar [29] and Hatoum and Kaplan [30].

Statistical analysis

Data were analyzed using SPSS 22.0 software. Normality of the data was inspected. Both mean percent weight loss and adherence to dietary guidelines showed a skewed distribution caused by a few outliers. Hence, for t tests and correlation analysis, weight loss and adherence data were winsorized (replacing outliers with the next lowest score). SF-36 scales showed a very skewed distribution. For analyses with SF-36 nonparametric tests were used. Kruskall-Wallis test was used to compare SF-36 distributions among different type of surgery groups. Mann-Whitney test was used to compare SF-36 means in different follow-up groups, in different mental healthcare consumption groups and in different employment status groups. For testing associations between variables, Pearson correlation, Spearman's rank-order correlation or χ^2 tests were chosen, where appropriate. Significance was assumed at $P < .05$. Descriptive data are expressed as mean ± standard deviation for continuous variables and as percentages for categorical variables.

Results

Patient characteristics

A total of 326 young adult patients underwent bariatric surgery in one of the 4 hospitals in the past 6 years. As shown in the patient flowchart (Fig. 1), 184 patients were included in the study and interviewed by phone, and 96 of these patients completed the questionnaires. Data on weight loss are only available for patients who completed questionnaires. There were no differences between patients who did and did not complete questionnaires in terms of satisfaction with results of surgery ($t = .96$, $P = .34$) or self-rated QoL ($t = 1.10$, $P = .28$). Patient characteristics are presented in Table 1.

Weight loss. Weight loss descriptives are presented in table 2. Weight loss was unrelated to time since surgery ($r = –.08$, $P = .44$). Patients who underwent laparoscopic Roux-en-Y gastric bypass (RYGB) lost significantly more weight than patients who underwent laparoscopic sleeve gastrectomy (SG) ($t = –2.65$, $P = .01$). This difference was not apparent among patients in their first 2 postoperative years but did emerge among patients in their third to sixth postoperative year.

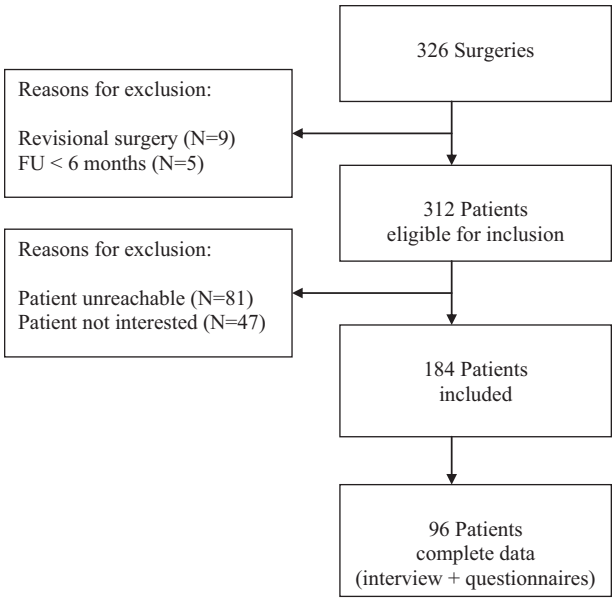

Fig. 1. Flowchart of study patients.

Dietary and exercise habits

Of the 96 patients who filled out and returned the lifestyle questionnaire, 73% reported "sometimes" eating fatty meals and 61% reported "sometimes" eating high-caloric meals. Almost half of patients (46%) indicated they did not engage in sports, 32% stated they exercised <30 min/d, and 51% reported spending >2 hr/d in front of television or computer. Adherence to dietary guidelines showed a mean of 6.4 (SD 1.9), with 26% of patients reporting insufficient dietary adherence (score <6). Adherence declined when follow-up time increased ($r = –.25$, $P = .02$). Patients with lower levels of adherence lost significantly less weight ($r = .29$, $P = .005$), with dietary adherence explaining 8.3% of the variance in mean percent weight loss.

QoL and psychosocial functioning

SF-36 scale scores are presented in Table 3. Patients scored lower than young adults in the general population on all of the SF-36 scales, but within 1 standard deviation from the general population mean scores (table 3). There was, however, a larger spread around the mean in the patient sample than in the general population, indicating higher numbers of relatively well-adjusted patients as well as relatively poorly adjusted patients. There were no significant differences in SF-36 scale scores for different types of surgery, nor for different lengths of follow-up. Of the 8 SF-36 scales, only 2 were related to weight loss ($r_s = .25$ for Physical Functioning, $P = .02$; $r_s = .25$ for General Health, $P = .02$).

Table 1
Patient characteristics (n = 184)

Patient Characteristic	
Age at surgery, yr (mean ± SD)	21.4 ± 1.6
Time since surgery, mo (mean ± SD)	33 ± 17 (range 6–74)
First year, n (%)	24 (13)
Second year, n (%)	52 (28)
Third year, n (%)	29 (16)
Fourth year, n (%)	46 (25)
Fifth year, n (%)	20 (11)
Sixth year, n (%)	13 (7)
Preoperative body mass index (mean ± SD) (N = 96)	45.6 ± 5.6 (range 36.6–60.0)
Sex, n (%)	
Male	24 (13)
Female	160 (87)
Relationship status, n (%)	
In relationship	128 (70)
Single	56 (30)
Education/Employment status, n (%)	
In education or employment	138 (75)
Not in education or employment	46 (25)
Type of surgery	
Gastric band, n (%)	13 (7)
Sleeve gastrectomy, n (%)	82 (45)
Gastric bypass, n (%)	79 (43)
Mini gastric bypass, n (%)	10 (5)
Hospital	
ZGT (Hengelo), n (%)	14 (7)
Slotervaart (Amsterdam), n (%)	18 (10)
MCL (Leeuwarden), n (%)	42 (23)
Catharina (Eindhoven), n (%)	110 (60)

In the total group of 184 patients, 70% had a partner, similar to the number of young adults in the general population that is involved in a relationship [20]. Twenty-five percent were NEET, 3 times as much as the percentage of NEETs in the young adult general population [21]. NEET patients scored significantly lower on all of the SF-36 scales compared to patients in education or employment. Education or employment status was not related to weight loss ($\chi^2 = .61$, $P = .59$). Thirty-eight percent of patients received mental healthcare since surgery. Of these patients, 27% indicated having problems regulating emotions, 23% indicated having depressive symptoms, 17% reported disordered eating behavior, 17% had negative self-image, and 8% indicated having personality problems. Patients receiving mental healthcare scored significantly lower on all of the SF-36 scales except Physical Role Functioning, compared with patients not receiving mental healthcare. Mental healthcare consumption had no relationship with weight loss ($\chi^2 = 1.50$, $P = .28$).

Table 3.
SF-36 Scores n = 96

SF-36 scale	Present study Ages 18–24 yr	Dutch norms [21] Ages 16–40 yr	US norms [22] Ages 18–24 yr
Physical Functioning	88.9 ± 15.2	93.1 ± 11.8	92.1 ± 18.3
Role-Physical	80.8 ± 32.7	86.4 ± 27.6	89.1 ± 26.8
Bodily Pain	75.4 ± 26.3	80.9 ± 19.4	80.8 ± 21.3
General Health	63.5 ± 21.3	78.2 ± 17.3	76.7 ± 18.2
Vitality	60.8 ± 20.3	70.7 ± 16.4	62.5 ± 19.8
Social Functioning	78.5 ± 25.0	87.8 ± 19.1	83.9 ± 20.6
Role-Emotional	75.5 ± 35.3	85.4 ± 30.0	83.0 ± 31.1
Mental Health	73.1 ± 17.5	78.7 ± 15.2	74.4 ± 18.1

Discussion

This study specifically targeted young adults in evaluating weight loss and QoL following bariatric surgery. As appeared from the results, young adult patients achieved weight loss comparable to weight loss in both adult [31–34] and adolescent [4,5,35,36] samples. Weight loss appeared relatively stable in the first 6 years after surgery, as no differences in weight loss emerged for different lengths of follow-up. However, in the third to sixth postoperative year, differences in weight loss between SG and RYGB patients became visible. In the longer run RYGB patients lost significantly more weight than SG patients, a finding corresponding with results from previous research [37].

Weight loss appeared to be related to adherence to postoperative dietary recommendations. Patients reporting poorer adherence demonstrated significantly less weight loss, with adherence explaining 8.3% of the variance in mean percent weight loss. Although dietary adherence was just sufficient in the entire sample, a quarter reported insufficient adherence and many patients reported unhealthy lifestyle behaviors. Adherence was lower in patients who underwent surgery longer ago, indicating problems complying with a dietary regimen in the long-term. These findings fit in with existing research documenting low and declining

Table 2
Weight loss descriptives

	Gastric band n = 10	Sleeve gastrectomy n = 39	Gastric bypass n = 39	Mini gastric bypass n = 8
Time since surgery, mo (mean ± SD)	28.4 ± 17.6 range 14–74	40.1 ± 16.3 range 13–67	33.5 ± 17.8 range 7–67	13.0 ± 6.6 range 6–23
Change in BMI (mean ± SD)	–9.1 ± 8.5	–13.6 ± 5.7	–16.4 ± 3.8	–16.1 ± 4.5
Total weight loss, kg (mean ± SD)	25.5 ± 24.3	40.0 ± 17.6	49.7 ± 11.7	46.4 ± 13.4
%TWL	20.3 ± 18.3	30.2 ± 10.7	35.6 ± 6.9	35.2 ± 7.1
%EWL	47.9 ± 45.0	69.9 ± 26.9	79.6 ± 17.6	81.9 ± 18.9
Satisfaction, 0–10 (mean ± SD)	6.3 ± 2.9 (n = 13)	8.0 ± 1.8 (n = 82)	8.4 ± 1.6 (n = 79)	9.0 ± 1.1 (n = 10)

BMI = body mass index; SD = standard deviation; %TWL = % total weight loss, calculated as 100 × (weight reduction/initial weight); %EWL = % excess weight loss, calculated as 100 × [BMI reduction/(initial BMI – 25)].

compliance with postoperative behavioral recommendations [9,11,14]. In the broader field of chronic medical conditions, nonadherence to medical regimens appears to be common in young patients [38]. Problems with maintaining compliance may be understood from neuroscientific research, demonstrating that the adolescent brain continues to mature well into the 20s [39,40]. Until the prefrontal cortex of the brain has fully developed, youngsters may struggle with executive functions such as planning behavior and controlling impulses and strong emotions [41]. In bariatric surgery patients, executive dysfunction has been linked to nonadherence to postoperative guidelines [42]. With a brain that is still maturing and in a life stage that is full of changes and challenges, the young adult's ability to comply with a long-term dietary regimen is under pressure. Preoperatively identifying those patients at risk for nonadherence could be the subject of future study. For clinical practice, it seems important to monitor and foster adherence to postoperative guidelines, especially in the longer term. Fostering adherence poses a challenge for the future, as cognitive behaviorally oriented interventions typically have limited success [43,44] and more unconscious mechanisms such as attachment anxiety [10,45] may need to be taken into account as well.

QoL was examined as second outcome measure in this study. In face of the threats morbid obesity poses to accomplishing psychosocial developmental tasks such as finding love and work [46], bariatric surgery offers opportunities to give impetus to psychosocial development and QoL. Because of the absence of a baseline measure, we were not able to track changes in QoL pre- to postsurgery. Comparing postsurgery SF-36 scores to national norms for young adults [21], QoL appeared to be lagging behind. A large spread in SF-36 scores pointed to a relatively large subgroup of patients scoring toward the lower end of QoL domains. Remarkably, QoL was largely unrelated to weight loss. Only physical functioning and general health were related to weight loss, not vitality and socio-emotional functioning. These findings are in line with recent studies in adult patients showing that weight loss is related to physical but not mental domains of QoL [47,48]. Reviews suggest that psychosocial QoL fails to improve long term after bariatric surgery, despite significant weight loss and major improvements in physical QoL [49,50]. Possibly, bariatric surgery makes patients healthier but not necessarily happier.

A substantial number of patients (38%) turned out to receive mental healthcare since surgery. Other research pointed to a high presurgery prevalence of psychiatric conditions in young patients with morbid obesity [51] and it appears from the present study that postsurgery still many patients struggle with mental problems. Also, a substantial number of patients (25%) turned out to be NEET. This is 3 times the percentage of NEET's in the Dutch young adult population [20]. Studies with adult patients also showed that unemployment rates following bariatric surgery are higher than in the general population [52–54]. Both impaired physical and mental QoL were related to NEET status, given its association with all of the SF-36 scales. Weight loss, on the other hand, bore no relation to employment status. Evidently, there are still gains to be made in improving psychosocial functioning and QoL. This apparently requires more than weight loss surgery alone.

Regarding study strengths and limitations, the large number of included patients, the follow-up period up to 6 years, and the multicenter design of the study can be characterized as strengths of the present study. A limitation is its cross-sectional design, thereby not allowing us to assess changes in weight loss, dietary adherence, and QoL within patients over time, nor to infer causal associations between variables. Future research should ideally opt for a longitudinal design. Another limitation was the high percentage (41%) of eligible patients who could not be included. The majority of them could not be reached to solicit their participation, despite considerable effort (5 attempted phone calls). This challenges generalizability of study results, but also raises concern for the follow-up of patients in clinical practice. Puzziferri et al. [55] warn that most bariatric surgery studies may report overly optimistic estimates for the effects of weight loss surgery because of incomplete follow-up. Treatment failure rates of 60% have been reported among patients not available for follow-up [56].

Conclusion

Young adult patients achieve weight loss comparable to adult patients following bariatric surgery, but moderate and declining adherence to behavioral recommendations poses a threat to weight loss and requires monitoring and intervention during follow-up, especially after the "honeymoon period" has passed. While bariatric surgery helps young adult patients to lose weight, many of them nevertheless show impaired psychosocial functioning, as apparent from the high number of patients not in school and not working, consuming mental healthcare and falling short of QoL norms for their age. Bariatric surgery in young adults should therefore ideally go hand in hand with nonsurgical interventions to make ground on psychosocial fields as well.

Disclosures

The authors have no commercial associations that might be a conflict of interest in relation to this article.

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