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Review Article

Bariatric Surgery on Diabetic Retinopathy

The Effects of Bariatric Surgery on Diabetic Retinopathy Course: A Review and Meta-Analysis.

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Abstract: There is an increasing indication of bariatric surgery for metabolic diseases irrespective of body weight. Diabetic retinopathy is a serious disease; it is the leading cause of registered visual loss globally. Previous literature reported the deterioration of life-threatening diabetic retinopathy after bariatric surgery. Few studies assessed the same. Our aim of the study is to assess this meta-analysis for the effects of bariatric surgery on diabetic retinopathy remission. In addition, we assessed the effects of bariatric surgery on diabetic retinopathy deterioration. We systematically searched PubMed, Cochrane Library, and the first 100 articles in Google Scholar. The search engine was limited to articles published in English from the first published article up to June 2022. The following keywords were used, bariatric surgery, metabolic surgery, diabetic retinopathy, retinopathy remission, and retinopathy deterioration. The retrieved data were entered in a datasheet detailing the author's name, year and country of publication, the methodology, and the number of patients who deteriorated was stable or improved after bariatric surgery. The most recent RevMan (version 4.4.) was used for data analysis. From our study, we found that, out of the 386 studies screened, only 26 full texts were eligible and eleven studies fulfilled the inclusion and exclusion criteria. A lower deterioration rate was observed than stability, odd ratio, 0.05, 95% *CI,* 0.04-0.07, P-value, <0.001. Significant heterogeneity was observed, I^2=*54%,* P-value, 0.02, and Chi-square=21.76. in addition, a lower regression was found compared to stable retinopathy, odd ratio, 0.06, 95% *CI,* 0.03-0.13, P-value, <0.001. Significant heterogeneity was observed, I^2=*73%,* P-value, 0.0002, and Chi-square=29.67. Thus, Diabetic retinopathy remains stable among patients who underwent bariatric surgery. Few remissions were observed in the short term, while few patients deteriorated. Further randomized controlled studies comparing the effect of bariatric surgery and usual diabetic care are needed.

Keywords: Bariatric surgery, diabetic retinopathy, deterioration, regression

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1. INTRODUCTION

Diabetic retinopathy (DR) is the leading cause of registered blindness in the working age group[1]. Diabetic retinopathy is on the rise and mirroring the increasing prevalence of diabetes and obesity[2], DR is common and might be the first presentation of type 2 diabetes[3]. The disease is sight-threatening, needs meticulous follow-up, and has better glycemic control[4]. The American Diabetes Association included weight management as a priority[5]. Thus, an increasing uptake of bariatric surgery is expected with a great impact on diabetic retinopathy. DR is associated with poor glycemic control, long duration of diabetes, hypertension, smoking, and other metabolic syndrome parameters [6]. Data regarding the effects of bariatric surgery on health-related outcomes lack. Bariatric surgery is associated with a reduction or resolution of most of the above-mentioned risks.k factors [7]. However, previous studies documented the initial deterioration of diabetic retinopathy following bariatric surgery and attributed it to the rapid glycemic control, osmotic changes, and the synergistic effects of insulin effect on endothelial growth [8]. A recent study conducted in China found that bariatric surgery improved most obesity-related comorbidities including diabetic retinopathy[9]. Merlotti and colleagues[10] concluded the benefits of bariatric surgery on DR prevention and suggested further studies regarding the progression or regression of retinopathy. On the other hand, a previous study[11] showed a deterioration following bariatric surgery. While Dascalu et al.[12] showed that, the majority of diabetic retinopathy remained stable. The deterioration observed after diabetic retinopathy might be due to micronutrient deficiency, stopping lipid-lowering medications including fenofibrate or angiotensin-converting enzyme inhibitors [13-17]. The long-term impact of bariatric surgery on the progression of diabetic retinopathy was discussed controversially [18, 19]. This meta-analysis aimed to assess the effects of bariatric surgery on diabetic retinopathy.

2. MATERIALS AND METHODS

2.1. Eligibility criteria according to PICOS

Studies were eligible if they were prospective or retrospective studies, case-control, or clinical trials published in English and report the effects of bariatric surgery on diabetic retinopathy (stable, progression, or regression). Case studies, case series, animal studies, and experimental studies were excluded. The studies were expected to report the long-term effects of bariatric surgery as the initial deterioration is expected due to rapid glycemic control.

2.2. Outcome measures

The outcome measures were deterioration or improvement in diabetic retinopathy after bariatric surgery.

2.3. Literature search and data extraction

A systematic literature search was conducted in PubMed MEDLINE, Cochrane Library, and Google Scholar from the date of its first inception up to June 2022. Two reviewers searched the databases for relevant articles. The terms diabetic retinopathy, Bariatric surgery, gastric bypass, sleeve gastrectomy, and Roux-en-Y gastric bypass were used. The titles, abstracts, and references of the included studies were screened. Any discrepancy was solved by a consensus. Permission was taken from the institution and from the Saudi Digital Library to access the data and for publishing the study. There were 386 studies and 270 stands after the removal of duplication, from them, 26 full texts were screened and only 11 studies were included in the final meta-analysis. The Saudi Digital Library was used for data search; the data were free for the researchers affiliated with the University. A data sheet was used to extract the author's name year and country of publication, the study type, and the number of stable, deterioration, and improvements in diabetic retinopathy. Figure 1 and Table 1.

2.4. Statistical analysis

The most recent version of the RevMan system was used. We pooled 20 cohorts from the included eleven studies (eleven showed progression and nine showed improvement). The dichotomous data were entered manually and the random effect was applied due to the significant heterogeneity. A P-value of <0.05 was considered significant.

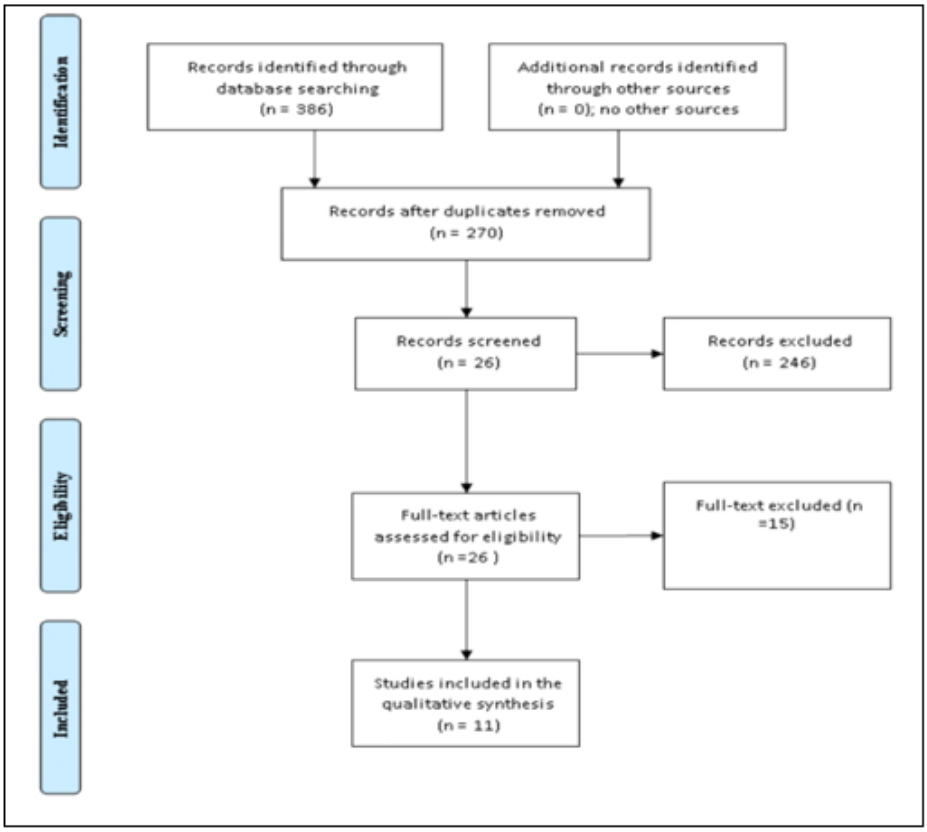

Fig 1: Bariatric surgery effects on diabetic retinopathy (The PRISMA Chart)

Table 1: The pattern of diabetic retinopathy after bariatric surgery

Author	Year	Country	Study type	Increased	Stable	Decreased
Amin et al.[20]	2016	UK	Case-control	5/41	113/152	5/41
Brynskov et al.[21]	2016	Denmark	Prospective	3/24	49/56	4/24
Chen et al.[7]	2017	UK	Retrospective	13/68	48/68	7/68
Kim et al.[22]	2015	Korea	Retrospective	7/8	10/12	1/8
Miras et al.[23]	2012	UK	Prospective	1/28	61/67	5/28
Miras et al.[24]	2015	UK	Prospective	6/56	44/56	6/56
Morén et al.[25]	2018	Sweden	Retrospective	19/117	98/117	Not studied
Murphy et al.[26]	2015	New Zealand	Retrospective	12/100	232/318	35/100
Richardson et al.[27]	2018	UK	Retrospective	14/64	50/64	Not studied
Thomas et al.[28]	2014	UK	Retrospective	3/12	26/38	5/12
Varadhan et al.[29]	2012	UK	Retrospective	2/7	16/22	2/7

3. RESULTS

Out of the 386 studies screened, only 26 full texts were eligible and eleven studies fulfilled the inclusion and exclusion criteria. Ten of the studies were retrospective and one prospective cohort (ten were published in Europe and one from Asia). We pooled 20 cohorts from 11 studies [3, 20-29]. In the current analysis, the 11 included studies showed a lower deterioration rate than stability, odd ratio, 0.05, 95% *CI,* 0.04-0.07, P-value, <0.001. Significant heterogeneity was observed, I^2=*54%,* P-value, 0.02, and Chi-square=21.76. Figure 2. Regarding DR improvement, all the nine included studies showed a significant regression compared to stable retinopathy, odd ratio, 0.06, 95% *CI,* 0.03-0.13, P-value, <0.001. Significant heterogeneity was observed, I^2=*73%,* P-value, 0.0002, and Chi-square=29.67. Figure 3.

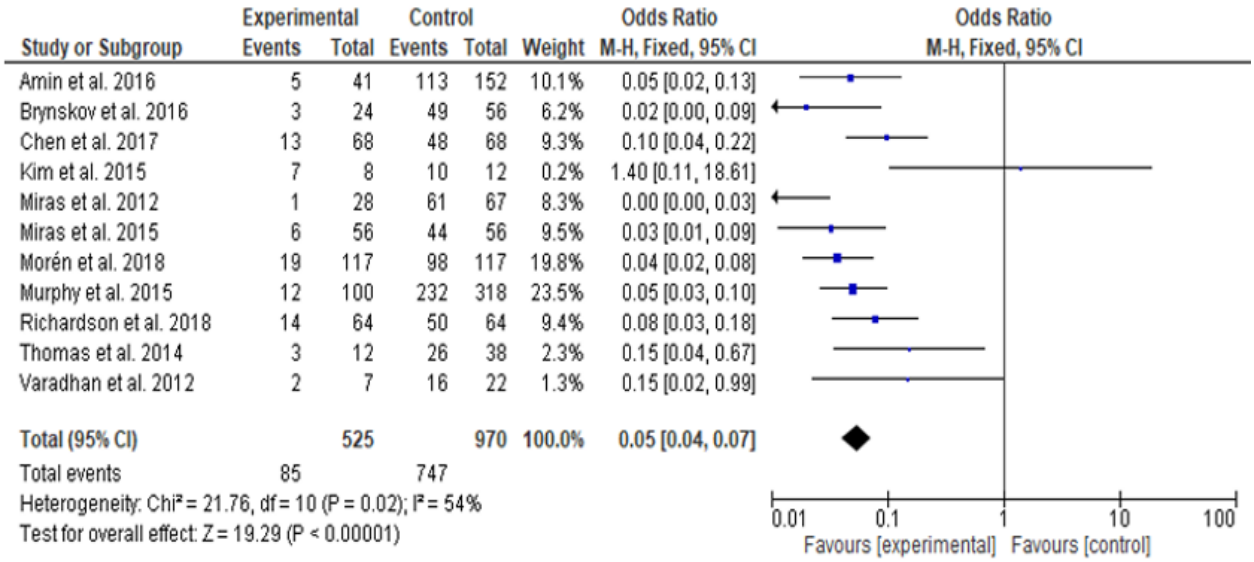

Fig 2: Bariatric surgery and deterioration of existing diabetic retinopathy.

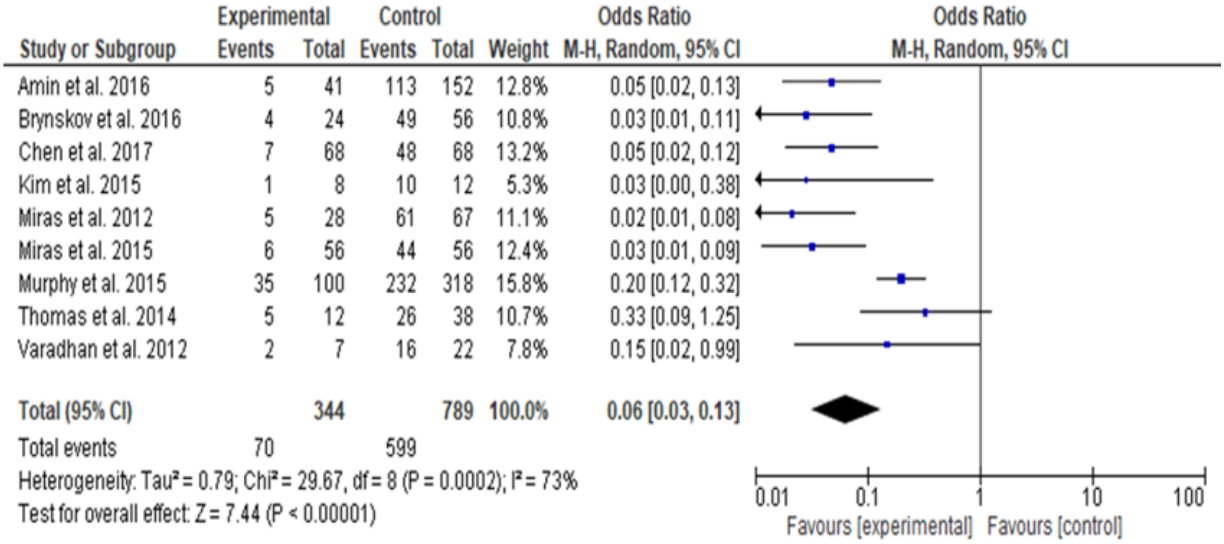

Fig 3: Bariatric surgery and diabetic retinopathy prevention.

4. DISCUSSION

The current study showed the long-term beneficial effects of bariatric surgery on diabetic retinopathy. However, the improvement of established diabetic retinopathy was not significant. A previous meta-analysis [11] assessed seven studies, compare diabetic retinopathy scores and found no difference between the two arms (bariatric surgery and medical therapy). Yu et al. [19] in their meta-analysis found a lower rate of diabetic retinopathy among patients who underwent bariatric surgery, although the initial progression of diabetic retinopathy was observed, a long-term progression was not observed. A systematic review and meta-analysis that included only four studies showed the worsening of diabetic retinopathy, especially among patients with pre-existing diseases [29]. The progression of diabetic retinopathy depends on the time and the state of retinopathy before surgery; it is usually observed in the initial six months and attributed to osmotic changes, and synergistic effects of insulin and other growth factors. Those with poor glycemic control and rapid reduction in the glycated hemoglobin, and pre-existing severe diabetic retinopathy [8].

4.1. Early worsening of diabetic retinopathy (EWDR)

EDWR is usually observed before the long-term benefits of improvement in glycemic control (the initial 3-6 months). It can be observed among patients after bariatric surgery, and intensive treatment (both type 1 &2 patients with diabetes, and after pancreatic transplantation) [30].

4.2. Importance and nature of EWDR

Although the EWDR is usually transient. However, irreversible retinal damage may occur in those with severe pre-existing DR. The changes are usually intraretinal microvascular abnormalities and cotton wool spots [30].

4.3. Risk factors of EWDR

The risk factors are poor glycemic control, long duration of diabetes mellitus, hypertension, severe diabetic retinopathy,

and the magnitude and rapidity of blood glucose reduction. Slow reduction of glycemic control, laser therapy for severe retinopathy, and meticulous follow-up are needed [7, 30].

5. CONCLUSION

Our study shows some evidence o**f** the long-term beneficial effects of bariatric surgery on diabetic retinopathy. However, the improvement of established diabetic retinopathy was not significant. Diabetic retinopathy remains stable among patients who underwent bariatric surgery. Few remissions were observed in the short term, while few patients deteriorated. Our results indicated the benefits of bariatric surgery on diabetic retinopathy. Further randomized controlled studies comparing the effect of bariatric surgery and usual diabetic care are needed.

6. ACKNOWLEDGEMENT

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7. AUTHORS CONTRIBUTION STATEMENT

H.M. and W.A. conceived of the presented idea. D.A. and A. A. Searched the literature. H. M. analyzed the data and drafted the results. R.A. O.A. and R. J drafted the introduction and methods. All authors discussed the results and contributed to the final manuscript.

8. CONFLICT OF INTEREST

Conflict of interest declared none.

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