

# GASTRIC BYPASS AND ALCOHOL USE: A LITERATURE REVIEW

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## SUMMARY

**Background:** Obesity is public health issue; bariatric surgery is considered as the most efficient treatment. However, the risk of developing an alcohol use disorder could increase after Roux-en-Y bypass. The purpose of this review is to emphasize the further research needed in this area.

**Methods:** Pubmed and Scienccedirect databases were searched. Articles written in another language than French or English as well as abstracts, conference presentations, editorials and expert opinions were excluded.

**Results:** Most of studies included in this review show an increased risk of developing an AUD (alcohol use disorder) after gastric bypass surgery. Male sex, younger age, smoking, regular alcohol consumption, AUD, recreational drug use, lower sense of belonging and undergoing a RYGB (Roux-en-Y gastric bypass) were identified as risk factors. There is an alteration of alcohol metabolism after gastric bypass. Gut hormones could also play a role in the development of AUD. The hypothesis of an addiction transfer is still controversial.

**Conclusions:** The risk of developing an AUD seems to increase after surgery. Long term follow-up, after the second post-surgery year, is needed. Further researches are needed to understand the mechanisms that underlie the development of AUD.

**Key words:** gastric bypass - alcohol use disorder - bariatric surgery

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## INTRODUCTION

Obesity is a public health issue. Among the treatment possibilities, bariatric surgery is considered as the most efficient, resulting in remission of related comorbidities and reducing mortality (Buchwald et al. 2004).

Roux-en-Y gastric bypass and sleeve gastrectomy are the most used surgeries. LAGB (Laparoscopic Adjustable Gastric Banding) is now less used. The technic of the Roux-en-Y gastric bypass consists in recording the stomach directly to the small bowel.

However, the risk of developing an alcohol use disorder could increase postoperatively.

The purpose of this review is to emphasize the further research needed in this area.

## METHODS

Pubmed and Scienccedirect databases were searched by using the terms: "gastric by-pass", "Roux-en-Y gastric bypass", "RYGB" combined with "alcohol", "AUD", "alcohol consumption", "ethanol".

Articles that were written in another language than French or English were excluded.

Abstracts, conference presentations, editorials and expert opinions were also excluded.

## RESULTS

Most of studies show an increased risk of developing an AUD after gastric bypass surgery.

According to King et al. (2012) the risk of developing an AUD increases during the second year after surgery. This finding is consistent with the study of

Conason et al. which showed an increased risk of developing an AUD 24 months after surgery.

A retrospective study on patients treated at Mayo Clinic Addiction Treatment Program showed that patients meet criteria for AUD at  $3.1 \pm 0.5$  years and seek treatment at  $5.4 \pm 0.3$  years after surgery (Cuellar-Barboza et al. 2015).

Suzuki and al found a lifetime prevalence of AUD similar to the general population with individual who had a history of AUD being more at risk of relapse after surgery.

A double risk of inpatient care for alcohol abuse after RYGB in comparison to those who underwent a restrictive procedure was found by Östlund et al. (2013).

A prospective study with longer follow up period (8 to 22 years) was realized in Sweden, the results show an increased risk of alcohol abuse (Svensson et al. 2013). Another study took place in Sweden, this study measured the incidence of hospital admission for alcohol use disorder and showed a higher risk after RYGB (Backman et al. 2016).

In an observational study, 8% of the 201 participants developed an alcohol use disorder within 3 years after Roux-en-Y bypass (Mitchell et al. 2015).

In a prospective study in 10 U.S hospitals with seven years follow up one fifth of participants presented alcohol use disorder symptoms within 5 years after surgery (King et al. 2012).

A study with structured interviews and self-report assessments showed that patients went back to their preoperative drinking frequencies but sought more treatment (Smith et al. 2017).

White and al explored alcohol related mortality and found a significantly higher rate of drug and alcohol related-mortality after RYGB.

According to integrative reviews (Gregorio et al. 2016, Ferrairo et al. 2016) alcohol consumption increases after gastric bypass procedure. In a meta-analysis of ten studies, Azam and al concluded that prevalence of AUD increased 2 years after RYGB.

In contradiction, some studies show decreased alcohol consumption (Lent et al. 2013, De Araujo Burgos et al, 2015, Walther et al. 2018).

A study with 70 patients followed 6-10 years after surgery suggested that most participants did not change their alcohol consumption (Ertelt et al. 2008).

Wee et al. (2014) reported improvement of high risk alcohol behavior which was present at baseline after the surgical procedure.

Experimental studies were made on rats. According to three studies, RYGB seems to increase new ethanol intake, independently from weight loss (Hajnal et al. 2012, Davis et al. 2012, Thanos et al. 2012).

Polston and al made a study on intravenously (IV) administered ethanol. According to this study, RYGB could increase the rewarding effects of alcohol independently of alcohol absorption.

In contradiction with these studies, Davis et al. (2012) showed that in ethanol preferring rats, RYGB reduced alcohol consumption.

### **Risk factors**

Some predictors of developing an AUD after surgery were identified: Male sex, younger age, smoking, regular alcohol consumption, former AUD, recreational drug use, lower sense of belonging and undergoing a RYGB (King et al. 2017).

Svensson et al. (2013) (also identify male sex, baseline smoking and baseline alcohol consumption as risk factors.

Male gender, age  $\geq 45$  years, and preoperative BMI  $< 40$  kg/m<sup>2</sup> were associated with alcohol use post-surgery in a study among a Portuguese population (De Araujo Burgos et al. 2015).

A study was made on a sample of young adults. Binge drinking is more frequent among this population, which is problematic as weight loss surgery increases alcohol sensitivity (Spadola et al. 2015).

In a systematic review of fifty-eight studies, the following factors were associated with alcohol use disorder after gastric by-pass: the type of surgery, a personal or family history of substance use disorder, coping skills/life stressors, age, male sex and alcohol sensitization after surgery (Kanji et al. 2019).

Binge eating disorder does not seem to be a risk factor (Cardoso et al. , Freire et al. 2020).

### **Role of pharmacokinetics**

There is an alteration of alcohol metabolism after gastric bypass (Woordard et al. 2011, Hagedorn et al. 2017).

Data show higher maximum alcohol concentrations in RYGB patients. Faster and higher blood alcohol concentration (BAC) were found in patients who undergo RYGB (Steffen et al. 2013, King et al. 2017, Ibrahim et al. 2018, Acevedo et al. 2020).

The rate of delivery of oral alcohol blood into the circulation is increased by gastric bypass (Pepino et al. 2015).

After RYGB, the alimentary bolus reaches jejunum faster. As the gastric volume is reduced, alcohol dehydrogenase, which influences first step of alcohol metabolism, is less available (Ferrario et al. 2016). After sleeve gastrectomy, alcohol dehydrogenase is more available and gastric emptying is slower than after RYGB.

This could partly explain why RYGB patients seem more at risk of developing an AUD (Ostlund et al. 2013, Svensson et al. 2013, King et al. 2017).

### **Role of gut hormones**

After the surgical procedure, ghrelin system and GLP-1 could play a role by impacting the rewarding effects of alcohol (Hajnal et al. 2012, David et al. 2013).

Circulating levels of ghrelin are reduced after RYGB, which could lead to a lower GHSR (Growth Hormone Secretagogue Receptor) control of VTA DA (Ventral Tegmental Area Dopamine) neuronal firing (Sirohi et al. 2017).

There could be an alteration of genetic expression in the regions of the brain associated with the reward circuit (David et al. 2013, Blackburn et al. 2016)

### **The switch theory**

In 2017, Yoder et al. (2017) conducted a research with semi-structured interviews among eight patients. Participants reported what was classified by the authors as “unresolved psychological issues” managed by eating behaviors such as binge eating. After the surgery participants found a new way to deal with their stress, which can lead to the development of AUD.

However, in contradiction with this hypothesis, development of AUD seems to be dependent of the surgical procedure (King et al. 2017, Svensson et al. 2013) which cannot be explained by an “addiction transfer” theory.

## **DISCUSSION**

The studies included in this review present significant variations: their sample size, methodology, follow-up duration, the definitions of alcohol use disorder as well as the way to measure it.

Most studies provide data for 2-3 years post-surgery. However, AUD seems to develop after this period, which emphasizes the need of more long term studies (Spadola et al. 2016).

About the studies cohorts, male sex seems to be a risk factor, but most studies are made on women so far.

The pre-surgery evaluation should screen not only the current alcohol use but also lifetime history of alcohol use (Suzuki et al. 2010), as this could be a risk factor.

Gut hormones seem to play a role in developing AUD post bypass. However, those studies were made on rodents, and it remains unclear if they could be transposed to humans.

A recent review of predictors and mechanisms (Ivezaj et al. 2019) suggests that there could be several mechanisms that lead to the development of AUD post-surgery. Specific surgery factors such as gut peptides and alcohol pharmacokinetics could play a role, but nonspecific factors, such as change in gene expression, need to be explored.

## CONCLUSIONS

In summary, the risk of developing an AUD increases after RYGB in most studies. More prospective studies with a long term follow up should be realized, as the alcohol use disorder is often not diagnosed before the second post-operative year.

Further researches are needed to understand the mechanisms that underlie the development of AUD.

Finally, patients experiencing difficulties with their alcohol consumption after RYGB should be referred to addictology follow-up. The risk of developing an AUD after surgery should be included in the preoperative counselling.

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Marie Briegleb wrote the first draft of the manuscript.

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This publication has been approved by both authors as well by responsible authorities where the work has been carried out. The authors declare that the work described has not been published before and that it is not under consideration for publication anywhere else.

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