**Name of Journal:** *World Journal of Gastrointestinal Oncology*

**Manuscript NO:** 68563

**Manuscript Type:** MINIREVIEWS

**Effect of oncometabolic surgery on gastric cancer: The remission of hypertension, type 2 diabetes mellitus, and beyond**

Cheng YX *et al*. Effect of oncometabolic surgery

Yu-Xi Cheng, Dong Peng, Wei Tao, Wei Zhang

**Yu-Xi Cheng, Dong Peng, Wei Tao, Wei Zhang,** Department of Gastrointestinal Surgery, The First Affiliated Hospital of Chongqing Medical University, Chongqing 400016, China

**Author contributions:** Cheng YX and Peng D contributed equally to this work; Zhang Wei conducted quality evaluation; Peng D and Cheng YX conducted data extraction; Tao Wei conducted figure painting; Cheng YX wrote the manuscript; Peng D, Cheng YX, Tao W and Zhang W conducted writing review and editing; all authors read and approved the final manuscript.

**Corresponding author: Wei Zhang, PhD, Surgeon,** Department of Gastrointestinal Surgery, The First Affiliated Hospital of Chongqing Medical University, No. 1 Youyi Road, Yuanjiagang, Yuzhong District, Chongqing 400016, China. cyzhangwei@hotmail.com

**Received:** May 27, 2021

**Revised:** June 24, 2021

**Accepted:** July 29, 2021

**Published online:** September 15, 2021

**Abstract**

This review summarizes the definition and surgical methods of oncometabolic surgery according to previous studies. Then, the authors discuss the beneficial effects observed after gastrectomy in gastric cancer (GC) patients with concurrent hypertension or type 2 diabetes mellitus (T2DM). The authors summarize the current studies analyzing the remission rate and the hypotheses of the mechanisms underlying these effects. The remission rate ranged from 42.5%-65.4% in T2DM patients and from 11.1%-57.6% among those with hypertension. Furthermore, the remission of T2DM could have an impact on overall survival rates as well. The mechanisms underlying the remission of hypertension and T2DM is unclear in current studies, but oncometabolic surgery is expected to be applied in clinical practice. In addition, the effect of oncometabolic surgery on other chronic metabolic comorbidities is expected to be proven in further studies. Therefore, the purpose of this review is to discuss the effects of oncometabolic surgery reported in current studies with a primary focus on the remission of hypertension and T2DM after gastrectomy in GC patients. The possibility of the remission of other metabolic comorbidities in GC patients who undergo oncometabolic surgery is also discussed.

**Key Words:** Gastric cancer; Type 2 diabetes mellitus; Hypertension; Remission; Oncometabolic surgery

**©The** **Author(s) 2021.** Published by Baishideng Publishing Group Inc. All rights reserved.

**Citation:** Cheng YX, Peng D, Tao W, Zhang W. Effect of oncometabolic surgery on gastric cancer: the remission of hypertension, type 2 diabetes mellitus, and beyond. *World J Gastrointest Oncol* 2021; 13(9): 1157-1163

**URL:** https://www.wjgnet.com/1948-5204/full/v13/i9/1157.htm

**DOI:** https://dx.doi.org/10.4251/wjgo.v13.i9.1157

**Core Tip:** The purpose of this review is to discuss the effects of oncometabolic surgery observed in current studies, mainly including the remission of hypertension and type 2 diabetes mellitus after gastrectomy in gastric cancer (GC) patients, and to evaluate the possibility of the remission of other metabolic comorbidities in GC patients who undergo oncometabolic surgery.

**INTRODUCTION**

Gastric cancer (GC) is the second most common digestive system cancer. As estimated by GLOBOCAN in 2018, the incidence of GC ranks fifth among all cancers, with 1 million new cases and 780 thousand deaths worldwide[1]. Radical resection plus standardized D2 Lymphadenectomy is the standard method for curative intention[2]. The 5-year survival rate of early GC patients has reached 90%, causing concern about these patients’ quality of life after gastrectomy[3,4]. With the number of cancer-related deaths decreasing among postoperative GC patients, the control of chronic diseases has become another medical concern.

The initial and obvious purpose of bariatric surgery is to achieve weight loss and maintenance[5]. However, morbid obesity drastically elevates the risk of some chronic metabolic comorbidities, especially the most common diseases including hypertension, type 2 diabetes mellitus (T2DM), dyslipidemia, sleep apnea, and so on[6]. It has rapidly come under observation that bariatric surgery is effective in treating metabolic comorbidities in obese patients[7,8]. A meta-analysis including eleven randomized controlled trials reported by Cummings and Cohen provided class 1A evidence demonstrating the effect of bariatric surgery on T2DM remission[9]. Thus, the concept of metabolic bariatric surgery is gradually being developed.

To our knowledge, the extent of gastrectomy and reconstruction methods in bariatric surgery has a strong level of similarity with that in gastrectomy of GC patients. Therefore, surgeons began to pay close attention to the remission of hypertension or T2DM after gastrectomy in patients who suffer from concurrent GC and metabolic comorbidities[10,11]. Fortunately, this hypothesis was proposed in some previous studies of oncometabolic surgery[12,13]. It has been reported that insulin resistance improves and fasting blood glucose returns to normal after gastrectomy, although controversy regarding the mechanism underlying this remission still exists[14]. There was a retrospective study of 143 patients in which the hypertension remission rate after gastrectomy was evaluated[15], and it was relatively less than the T2DM remission rate reported in previous studies.

Although limited studies exist, the potential of oncometabolic surgery is nonnegligible. Therefore, the purpose of this review is to discuss the effect of oncometabolic surgery based on current studies, mainly including the remission of hypertension and T2DM after gastrectomy in GC patients, and to evaluate the possibility of the remission of other metabolic comorbidities in patients who undergo oncometabolic surgery.

**Concept of oncometabolic surgery**

Oncometabolic surgery is a single operation that not only achieves tumor radical resection but also controls metabolic diseases, including hypertension and T2DM[10,16]. The extent of gastrectomy includes total gastrectomy and subtotal gastrectomy, and the reconstruction methods consist of Billroth I (B-I), Billroth II (B-II) and Roux-en-Y (RY) reconstruction (Figure 1). In a previous study, it was demonstrated that total gastrectomy with RY reconstruction had the highest remission rate[17]. In addition, Peng *et al*[18] considered that only the extent of gastrectomy influenced T2DM remission[18]. Similarly, Wang *et al*[19] found that total gastrectomy itself was closely related to hypertension remission[19]. Park *et al*[20] considered that long-limb RY reconstruction, which is closely associated with RY gastric bypass, was oncometabolic surgery[20]. However, we considered total gastrectomy and subtotal gastrectomy with all reconstruction methods, including B-I reconstruction, B-II reconstruction, RY reconstruction, conventional uncut RY gastrojejunostomy, and long-limb uncut RY gastrojejunostomy, as oncometabolic surgeries.

**T2DM remission**

GC patients can experience T2DM remission after gastrectomy, and the remission rate ranges from 42.5%-65.4% (Table 1)[13,14,17,21-26]. However, the factors predicting T2DM remission remain unclear. An *et al*[13] suggested that the degree of T2DM control was related to its duration[13]. Kim *et al*[17] analyzed the records of 385 patients and concluded that body mass index reduction was significantly correlated with T2DM remission. Total gastrectomy with RY reconstruction was reported to lead to higher remission rates than other surgical methods, however, whether the extent of gastrectomy or the reconstruction method played an important role in T2DM remission remains controversial[17]. Wang *et al*[21] reported that the extent of gastrectomy rather than the reconstruction method was the key factor affecting T2DM remission[21], but Choi *et al*[22] suggested that RY reconstruction played an important role in T2DM remission[22]. Peng *et al*[18] conducted a meta-analysis and reported that the extent of gastrectomy rather than the reconstruction method might play an important role in T2DM remission after gastrectomy in patients with GC[18]. However, there were only three studies in the subgroup analysis about the extent of gastrectomy on T2DM remission; therefore, the results might not be robust[17,18,21].

The remission of T2DM could also have an impact on overall survival. Wei *et al*[23] compared a remission group with a non-remission group and found that recovery from pre-existing T2DM after radical gastrectomy was associated with better overall survival; however, the study included only 67 patients, and larger studies are needed in the future[23].

The mechanism underlying T2DM remission after gastrectomy is unclear, but bariatric surgery might contribute to T2DM remission in a similar way. T2DM remission was related to lifestyle changes, including decreased food intake, reduced body weight and intestinal malabsorption. Several theories explaining T2DM remission beyond lifestyle changes have been proposed. The foregut theory states that patients undergoing duodenal bypass experience anti-diabetic effects, and the hindgut theory states that early contact of unabsorbed nutrients with the distal intestine improves T2DM. Furthermore, hormones, including ghrelin, glucagon-like peptide (GLP)-1 and GLP-2, can influence T2DM remission.

**Hypertension remission**

GC patients also experience hypertension remission after gastrectomy. Peng *et al*[15] conducted a retrospective study of 143 patients who underwent gastrectomy and the resulting effects on hypertension and found that the hypertension complete remission rate was 55.3%. In addition, age and total gastrectomy were predictors of hypertension remission 6 mo after gastrectomy[15]. Wang *et al*[19] compared hypertension remission between total gastrectomy and subtotal gastrectomy in non-obese non-diabetic GC patients and found that total gastrectomy itself, beyond weight loss, was associated with hypertension remission[19]. Another study included 33 patients and found that 14 patients experienced hypertension remission 1 year after gastrectomy[20]. Kim *et al*[27] reported on 66 early GC patients undergoing gastrectomy and endoscopic submucosal dissection and found that the hypertension remission rate was 57.6%, and gastrectomy was a predictor of hypertension remission 1 year after surgery[27]. Lee *et al*[12] reported the largest number of patients (*n* = 351) from nationwide data, and after a follow-up of 36.7 mo, only 11.1% of patients experienced hypertension remission; however, the results analyzed were based on nationwide data, and limited baseline information was available[12]. Therefore, the hypertension remission rate after gastrectomy was 11.1%-57.6% (Table 2), and Peng *et al*[15] proposed that total gastrectomy is an oncometabolic surgery that can cure younger patients with concurrent GC and hypertension[15].

There were some limitations because of the limited number of studies. Previous studies reported on the remission of hypertension; however, the follow-up time was short, and hypertension might reoccur in long term follow-up. In addition, the improvement of sodium absorption dysfunction, instead of weight loss, might be the factor leading to better management of blood pressure. However, no studies have reported the lifestyle factors of patients after gastrectomy, including physical exercise, drinking and smoking, and these lifestyle factors might also play an important role in hypertension remission.

Furthermore, the mechanism underlying hypertension remission is still unknown. It is hypothesized that the levels of some hormones, such as renin, angiotensin II, aldosterone, adiponectin, GLP-1, and tumor necrosis factor, might cause blood pressure fluctuations. However, a previous study found no difference in serum levels of these indicators before and after surgery. Thus, more experiments need to be carried out in the future.

**Future perspective**

Evidence for the effects of bariatric surgery (also referred to as metabolic surgery) on T2DM remission has been demonstrated in previous studies. Metabolic surgery is expected to become an alternative for the treatment of T2DM in the future, instead being used only for weight loss[28]. Similarly, it is notable that gastrectomy has the same metabolic effect as bariatric surgery on patients with concurrent GC and metabolic comorbidities. Thus, oncometabolic surgery, which has been considered a developing concept in recent years, has the ability to improve the quality of life of patients with metabolic comorbidities[10,16]. Surgeons continuously improve traditional gastrectomy techniques to benefit patients. T2DM remission after gastrectomy has been found to be associated with better overall survival outcomes[23], but there is no previous evidence demonstrating a relationship between hypertension remission and overall survival outcomes. Short follow-up times are the current obstacle to the observation of the remission of comorbidities that may influence long-term survival rates after gastrectomy.

In addition, the focus of attention in oncometabolic surgery research has been T2DM rather than hypertension or other metabolic comorbidities. The effects of oncometabolic surgery on other metabolic comorbidities, such as fatty liver disease, hyperglycemia and hyperosmotic syndrome, leukodystrophy, hyperlipidemia, gout, and osteoporosis, are expected to be evaluated in the future. With the maturation of the concept of oncometabolic surgery, the opportunity to treat both GC and metabolic diseases through a single operation is possible. Therefore, a larger sample size and basic medical experiments are needed in future research.

**CONCLUSION**

With the maturation of the concept of oncometabolic surgery, the opportunity to treat both GC and metabolic diseases through a single operation is possible.

**ACKNOWLEDGEMENTS**

We acknowledge all the authors whose publications are referred in our article.

**REFERENCES**

1 **Bray F**, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2018; **68**: 394-424 [PMID: 30207593 DOI: 10.3322/caac.21492]

2 **Sitarz R**, Skierucha M, Mielko J, Offerhaus GJA, Maciejewski R, Polkowski WP. Gastric cancer: epidemiology, prevention, classification, and treatment. *Cancer Manag Res* 2018; **10**: 239-248 [PMID: 29445300 DOI: 10.2147/CMAR.S149619]

3 **Kim YI**, Kim YW, Choi IJ, Kim CG, Lee JY, Cho SJ, Eom BW, Yoon HM, Ryu KW, Kook MC. Long-term survival after endoscopic resection *vs* surgery in early gastric cancers. *Endoscopy* 2015; **47**: 293-301 [PMID: 25625697 DOI: 10.1055/s-0034-1391284]

4 **McCall MD**, Graham PJ, Bathe OF. Quality of life: A critical outcome for all surgical treatments of gastric cancer. *World J Gastroenterol* 2016; **22**: 1101-1113 [PMID: 26811650 DOI: 10.3748/wjg.v22.i3.1101]

5 **Scopinaro N**. Bariatric metabolic surgery. *Rozhl Chir* 2014; **93**: 404-415 [PMID: 25230385]

6 **Valentí V**, Cienfuegos JA, Becerril Mañas S, Frühbeck G. Mechanism of bariatric and metabolic surgery: beyond surgeons, gastroenterologists and endocrinologists. *Rev Esp Enferm Dig* 2020; **112**: 229-233 [PMID: 32081018 DOI: 10.17235/reed.2020.6925/2020]

7 **Picot J**, Jones J, Colquitt JL, Gospodarevskaya E, Loveman E, Baxter L, Clegg AJ. The clinical effectiveness and cost-effectiveness of bariatric (weight loss) surgery for obesity: a systematic review and economic evaluation. *Health Technol Assess* 2009; **13**: 1-190, 215-357, iii-iiv [PMID: 19726018 DOI: 10.3310/hta13410]

8 **Rubio-Almanza M**, Cámara-Gómez R, Merino-Torres JF. Obesity and type 2 diabetes: Also linked in therapeutic options. *Endocrinol Diabetes Nutr (Engl Ed)* 2019; **66**: 140-149 [PMID: 30337188 DOI: 10.1016/j.endinu.2018.08.003]

9 **Buchwald H**, Buchwald JN. Metabolic (Bariatric and Nonbariatric) Surgery for Type 2 Diabetes: A Personal Perspective Review. *Diabetes Care* 2019; **42**: 331-340 [PMID: 30665965 DOI: 10.2337/dc17-2654]

10 **Lee TH**, Lee CM, Park S, Jung DH, Jang YJ, Kim JH, Park SH, Mok YJ. Long-term Follow-up for Type 2 Diabetes Mellitus after Gastrectomy in Non-morbidly Obese Patients with Gastric Cancer: the Legitimacy of Onco-metabolic Surgery. *J Gastric Cancer* 2017; **17**: 283-294 [PMID: 29302369 DOI: 10.5230/jgc.2017.17.e34]

11 **Renehan AG**, Yeh HC, Johnson JA, Wild SH, Gale EA, Møller H; Diabetes and Cancer Research Consortium. Diabetes and cancer (2): evaluating the impact of diabetes on mortality in patients with cancer. *Diabetologia* 2012; **55**: 1619-1632 [PMID: 22476948 DOI: 10.1007/s00125-012-2526-0]

12 **Lee EK**, Kim SY, Lee YJ, Kwak MH, Kim HJ, Choi IJ, Cho SJ, Kim YW, Lee JY, Kim CG, Yoon HM, Eom BW, Kong SY, Yoo MK, Park JH, Ryu KW. Improvement of diabetes and hypertension after gastrectomy: a nationwide cohort study. *World J Gastroenterol* 2015; **21**: 1173-1181 [PMID: 25632190 DOI: 10.3748/wjg.v21.i4.1173]

13 **An JY**, Kim YM, Yun MA, Jeon BH, Noh SH. Improvement of type 2 diabetes mellitus after gastric cancer surgery: short-term outcome analysis after gastrectomy. *World J Gastroenterol* 2013; **19**: 9410-9417 [PMID: 24409070 DOI: 10.3748/wjg.v19.i48.9410]

14 **Lee W**, Ahn SH, Lee JH, Park DJ, Lee HJ, Kim HH, Yang HK. Comparative study of diabetes mellitus resolution according to reconstruction type after gastrectomy in gastric cancer patients with diabetes mellitus. *Obes Surg* 2012; **22**: 1238-1243 [PMID: 22179701 DOI: 10.1007/s11695-011-0580-1]

15 **Peng D**, Cheng YX, Tao W, Zou YY, Qian K, Zhang W. Onco-Metabolic Surgery: A Combined Approach to Gastric Cancer and Hypertension. *Cancer Manag Res* 2020; **12**: 7867-7873 [PMID: 32922085 DOI: 10.2147/CMAR.S260147]

16 **Kim WJ**, Kwon Y, Lee CM, Lim SH, Li Y, Wang J, Hu W, Zheng J, Zhao G, Zhu C, Wang W, Xiong W, Wang Q, Xia M, Park S. Oncometabolic surgery: Emergence and legitimacy for investigation. *Chin J Cancer Res* 2020; **32**: 252-262 [PMID: 32410802 DOI: 10.21147/j.issn.1000-9604.2020.02.12]

17 **Kim JW**, Cheong JH, Hyung WJ, Choi SH, Noh SH. Outcome after gastrectomy in gastric cancer patients with type 2 diabetes. *World J Gastroenterol* 2012; **18**: 49-54 [PMID: 22228970 DOI: 10.3748/wjg.v18.i1.49]

18 **Peng D**, Cheng YX, Zhang W. Does Roux-en-Y Construction Really Bring Benefit of Type 2 Diabetes Mellitus Remission After Gastrectomy in Patients with Gastric Cancer? A Systematic Review and Meta-Analysis. *Diabetes Ther* 2020; **11**: 2863-2872 [PMID: 33006131 DOI: 10.1007/s13300-020-00934-7]

19 **Wang Y**, Yang W, Zhu Y, Jin N, Wu W, Zheng F. Decreased hypertension in non-obese non-diabetic gastric cancer patients after gastrectomy. *Asian J Surg* 2020; **43**: 926-929 [PMID: 32593493 DOI: 10.1016/j.asjsur.2020.04.009]

20 **Park YS**, Park DJ, Kim KH, Park DJ, Lee Y, Park KB, Min SH, Ahn SH, Kim HH. Nutritional safety of oncometabolic surgery for early gastric cancer patients: a prospective single-arm pilot study using a historical control group for comparison. *Surg Endosc* 2020; **34**: 275-283 [PMID: 30927123 DOI: 10.1007/s00464-019-06763-5]

21 **Wang KC**, Huang KH, Lan YT, Fang WL, Lo SS, Li AF, Wu CW. Outcome after curative surgery for gastric cancer patients with type 2 diabetes. *World J Surg* 2014; **38**: 431-438 [PMID: 24132827 DOI: 10.1007/s00268-013-2291-3]

22 **Choi YY**, Noh SH, An JY. A randomized controlled trial of Roux-en-Y gastrojejunostomy vs. gastroduodenostomy with respect to the improvement of type 2 diabetes mellitus after distal gastrectomy in gastric cancer patients. *PLoS One* 2017; **12**: e0188904 [PMID: 29216250 DOI: 10.1371/journal.pone.0188904]

23 **Wei ZW**, Li JL, Wu Y, Xia GK, Schwarz RE, He YL, Zhang CH. Impact of pre-existing type-2 diabetes on patient outcomes after radical resection for gastric cancer: a retrospective cohort study. *Dig Dis Sci* 2014; **59**: 1017-1024 [PMID: 24318804 DOI: 10.1007/s10620-013-2965-6]

24 **Zhu Z**, Shan X, Cheng Y, Xu J, Fu H, Wang W, Yan R, Cai Q. Clinical course of diabetes after gastrectomy according to type of reconstruction in patients with concurrent gastric cancer and type 2 diabetes. *Obes Surg* 2015; **25**: 673-679 [PMID: 25190521 DOI: 10.1007/s11695-014-1426-4]

25 **Kim JH**, Huh YJ, Park S, Park YS, Park DJ, Kwon JW, Lee JH, Heo YS, Choi SH. Multicenter results of long-limb bypass reconstruction after gastrectomy in patients with gastric cancer and type II diabetes. *Asian J Surg* 2020; **43**: 297-303 [PMID: 31060769 DOI: 10.1016/j.asjsur.2019.03.018]

26 **Park MJ**, Kim DH, Park BJ, Kim S, Park S, Rosenthal RJ. Impact of preoperative visceral fat proportion on type 2 diabetes in patients with low body mass index after gastrectomy. *Surg Obes Relat Dis* 2017; **13**: 1361-1368 [PMID: 28668209 DOI: 10.1016/j.soard.2017.05.012]

27 **Kim HJ**, Cho EJ, Kwak MH, Eom BW, Yoon HM, Cho SJ, Lee JY, Kim CG, Ryu KW, Kim YW, Choi IJ. Effect of gastrectomy on blood pressure in early gastric cancer survivors with hypertension. *Support Care Cancer* 2019; **27**: 2237-2245 [PMID: 30317431 DOI: 10.1007/s00520-018-4491-8]

28 **Lee WJ**, Almalki O. Recent advancements in bariatric/metabolic surgery. *Ann Gastroenterol Surg* 2017; **1**: 171-179 [PMID: 29863165 DOI: 10.1002/ags3.12030]

**Footnotes**

**Conflict-of-interest statement:** The authors declare that they have no competing interests.

**Open-Access:** This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: http://creativecommons.org/Licenses/by-nc/4.0/

**Manuscript source:** Invited manuscript

**Peer-review started:** May 27, 2021

**First decision:** June 16, 2021

**Article in press:** July 29, 2021

**Specialty type:** Oncology

**Country/Territory of origin:** China

**Peer-review report’s scientific quality classification**

Grade A (Excellent): 0

Grade B (Very good): B, B

Grade C (Good): 0

Grade D (Fair): 0

Grade E (Poor): 0

**P-Reviewer:** Papazafiropoulou A, Salman A **S-Editor:** Fan JR **L-Editor: A P-Editor:** Ma YJ

**Figure Legends**



**Figure 1** **Schematic illustration of gastrectomy and reconstruction methods.** A: Distal gastrectomy with Billroth I reconstruction; B: Distal gastrectomy with Roux-en-Y reconstruction; C: Distal gastrectomy with conventional uncut Roux-en-Y gastrojejunostomy; D: Distal gastrectomy with Billroth II reconstruction; E: Total gastrectomy with Roux-en-Y reconstruction; F: Distal gastrectomy with long-limb uncut Roux-en-Y gastrojejunostomy.

**Table 1 Oncometabolic surgery on type 2 diabetes**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Ref.** | **Surgery** | **Sample size** | **CR + PR** | **CR** | **PR** | **Follow-up (mo)** |
| Lee *et al*[14], 2012 | RYTG, BI, BII, RYGJ | 229 | 56.8% | 19.7% | 37.1% | NA |
| An *et al*[13], 2013 | RYTG, BI, BII | 64 | 57.8% | 3.1% | 54.7% | 12 |
| Wang *et al*[19], 2020 | RYTG, BI, BII, RYGJ | 69 | 43.5% | 13.0% | 30.5% | NA |
| Wei *et al*[23], 2014 | RYTG, BII | 67 | 59.7% | 26.9% | 32.8% | 57.4 |
| Kim *et al*[17], 2012 | RYTG, BI, BII | 385 | 45.5% | 15.1% | 30.4% | 33.7 |
| Zhu *et al*[24], 2015 | RYTG, BI, BII | 292 | 65.4% | 55.5% | 9.9% | 24 |
| Choi *et al*[22], 2017 | RYTG, BI | 40 | 42.5% | 2.5% | 40.0% | 12 |
| Kim *et al*[25], 2020 | LLBR, BII | 226 | 52.2% | 4.9% | 47.3% | 12 |
| Park *et al*[20], 2020 | RYTG, BI, BII, RYGJ | 52 | 63.5% | NA | NA | 12 |

CR: Complete remission; PR: Partial remission; RYTG: Roux-en-Y total gastrectomy; BI: Billroth I reconstruction; BII: Billroth II reconstruction; RYGJ: Subtotal gastrectomy with Roux-en-Y gastrojejunostomy reconstruction; LLBR: Long-limb bypass reconstruction; NA: Not available.

**Table 2 Oncometabolic surgery on hypertension**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Ref.** | **Country** | **Surgery** | **Sample size** | **CR + PR** | **CR** | **PR** | **Follow-up (mo)** |
| Peng *et al*[15], 2020 | China | RYTG, BI, BII, RYGJ | 143 | 55.3% | 46.9% | 8.4% | 6 |
| Wang *et al*[21], 2014 | China | RYTG, RYGJ | 16 | 93.8% | 100% | 87.5% | 12 |
| Park *et al*[26], 2017 | Korea | uRYGJ, LLBR | 33 | 42.4% | NA | NA | 12 |
| Kim *et al*[27], 2019 | Korea | RYTG, BI, BII, RYGJ | 66 | 57.6% | 45.5% | 12.1% | 12 |
| Lee *et al*[28], 2017 | Korea | RYTG, BI, BII, RYGJ | 351 | 11.1% | NA | NA | 36.7 |

CR: Complete remission; PR: Partial remission; RYTG: Roux-en-Y total gastrectomy; BII: Billroth II reconstruction; BI: Billroth I reconstruction; RYGJ: Subtotal gastrectomy with Roux-en-Y gastrojejunostomy reconstruction; uRYGJ: Subtotal gastrectomy with uncut Roux-en-Y gastrojejunostomy reconstruction; LLBR: Long-limb bypass reconstruction; NA: Not available.



Published by **Baishideng Publishing Group Inc**

7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

**Telephone:** +1-925-3991568

**E-mail:** bpgoffice@wjgnet.com

**Help Desk:** https://www.f6publishing.com/helpdesk

https://www.wjgnet.com



**© 2021 Baishideng Publishing Group Inc. All rights reserved.**