

Wound complications frequency in minor technique gastrectomy compared to open gastrectomy for gastric cancer: A meta-analysis

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Abstract

Background:

A meta-analysis investigation was executed to measure the wound complications (WCs) frequency in minor technique gastrectomy (MTG) compared to open gastrectomy (OG) for gastric cancer (GC).

Methods:

A comprehensive literature inspection till February 2023 was applied and 2078 interrelated investigations were reviewed. The 17 chosen investigations enclosed 12746 individuals with GC were in the chosen investigations' starting point, 3052 of them were utilizing robotic gastrectomy (RG), 6603 of them were utilizing laparoscopic gastrectomy (LG) and 3091 were utilizing OG. Odds ratio (OR) in addition to 95% confidence intervals (CIs) were utilized to compute the value of the WCs frequency in MTG compared to OG for GC by the dichotomous approaches and a fixed or random model.

Results:

No significant difference was found in surgical site wound infection (SSWI) between RG and OG (OR, 1.45; 95% CI, 0.89-2.35, $p=0.13$), LG and OG (OR, 0.75; 95% CI, 0.47-1.18, $p=0.21$), and RG and LG (OR, 1.07; 95% CI, 0.72-1.60, $p=0.73$) in individuals with GC.

Conclusions:

No significant difference was found in SSWI between RG, OG, and LG in individuals with GC. However, care must be exercised when dealing with its values because of the low number of nominated in the meta-analysis and the low sample size of some of the nominated investigations for the meta-analysis.

Keywords: minor technique gastrectomy; gastric cancer; open gastrectomy; surgical site wound infection

Introduction

In the field of general surgery, including the treatment of gastric cancer (GC), minor techniques of gastrectomy (MTG) is now often used. ¹ Robotic gastrectomy (RG) and laparoscopic gastrectomy (LG) are an MTG. Robotic surgery devices were first launched in 1997 as a means of overcoming the technological limitations of laparoscopic surgery. ² Because of their notable gains in visualization and manipulation, RG is better than traditional laparoscopic surgery when using this cutting-edge equipment. ³ Moreover, robotic surgery offers surgeons a convenient and comfortable setting while correctly performing lymph node dissection for GC. ⁴ The safety of this method has been shown in numerous papers. ⁵ The effectiveness and safety of laparoscopy gastrectomy and robot gastrectomy over open gastrectomy (OG) in the treatment of GC are not fully understood, nevertheless. Earlier findings were all based on the experience of a single institution, and there is no evidence from randomized controlled trials (RCTs). A meta-analysis of papers evaluating the safety of LG and RG against OG in treating GC are the objectives of this investigation. Hence, this meta-analysis's aim was to compare the wound complications (WCs) frequency in MTG compared to OG for GC.

Methods

Eligibility criteria

For the purpose of creating a summary, the investigations demonstrating the connection between MTG and OG with GC were chosen.⁶

Information sources

Figure 1 represents the whole investigation.

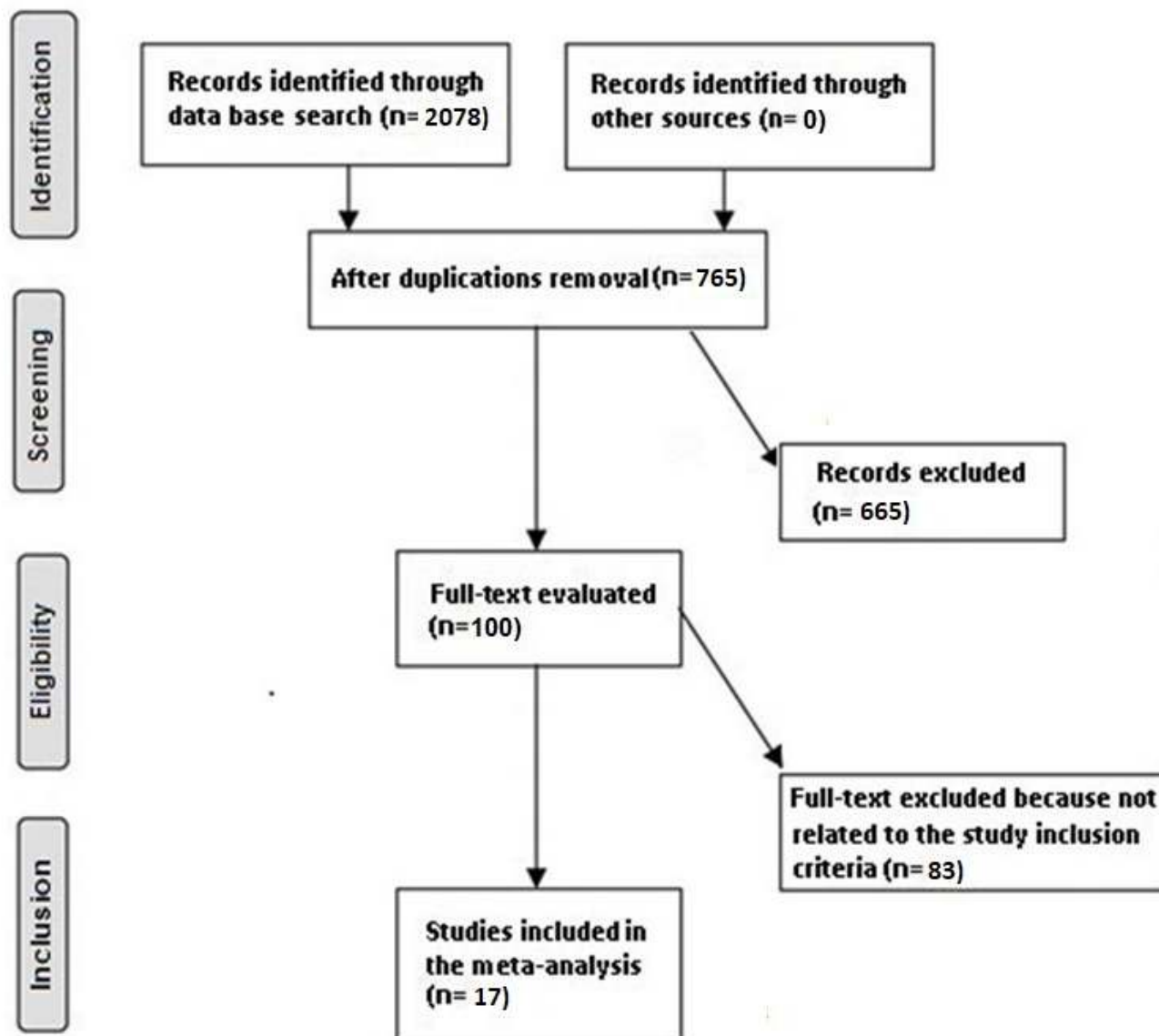


Figure 1 A flowchart of the investigation process.

The literature was incorporated into the investigation when the inclusion criteria were met:

1. The research was an observational, prospective, retrospective, or RCT investigation.
2. Individuals with GC were the investigated chosen individuals.
3. The intervention incorporated MTG and OG.
4. The investigation distinguished the WCs frequency in MTG compared to OG for GC.

The research was excluded if the significance of the comparison was not emphasized in it, investigations that didn't check the characteristics of the WCs frequency in MTG compared to OG for GC, and research on gastrectomy individuals without surgical site wound infection (SSWI).

Search strategy

A search protocol operations were recognized depending on the PICOS opinion, and we characterized it as next:

"population" individuals with GC, P; OG, and MTG are the "intervention" or "exposure," while the "comparison" was between RG, LG, and OG; SSWI were the "outcome" and last of all, the "study design" proposed investigation had no restrictions.⁷

We have searched Google Scholar, Embase, the Cochrane Library, PubMed, and OVID databases exhaustively till February 2023 utilizing an organization of keywords and accompanying terms for minor technique gastrectomy; gastric cancer; open gastrectomy; and surgical site wound infection as shown in Table 1. To avoid research that failed to establish a link between the consequences of the WCs frequency in MTG compared to OG for GC, replications were removed from the papers, they were joint into an EndNote file, and the titles and abstracts were reevaluated.

Table 1. Search Strategy for Each Database

Database	Search strategy
Pubmed	#1 "surgical site wound infection"[MeSH Terms] OR "gastric cancer"[All Fields] [All Fields] #2 "open gastrectomy"[MeSH Terms] OR "minor technique gastrectomy"[MeSH Terms] [All Fields] #3 #1 AND #2
Embase	'surgical site wound infection'/exp OR 'gastric cancer' #2 'open gastrectomy'/exp OR 'minor technique gastrectomy' #3 #1 AND #2
Cochrane library	(surgical site wound infection):ti,ab,kw (gastric cancer):ti,ab,kw (Word variations have been searched) #2 (open gastrectomy):ti,ab,kw OR (minor technique gastrectomy) :ti,ab,kw (Word variations have been searched) #3 #1 AND #2

Selection process

Following the epidemiological declaration, a process was formed, which was then organized and analyzed in the procedure of a meta-analysis.

Data collection process

Among the criteria utilized to collect data was the name of the primary author, the investigation date, the year of the investigation, the country or area, the population type, the medical and therapy physiognomies, categories, the quantitative and qualitative estimate process, the data source, the consequence estimate, and statistical analysis.⁸

Data items

Whenever an investigation had variable values, we separately acquired the data based on an evaluation of the WCs frequency in MTG compared to OG for GC.

Investigation risk of bias assessment

The author estimated the procedure of the selected publications to see whether there was a possibility that each investigation may have been biased. The procedural quality was estimated utilizing the "risk of bias instrument" from the Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0. After being categorized by the appraisal criteria, each investigation was allocated one of the bias risks indicated below: low: An investigation was categorized as having a low bias risk if all of the quality criteria were met; an investigation was categorized as having a medium bias risk if one or more requirements weren't met or weren't encompassed. The investigation was deemed to have a significant bias risk if one or more quality needs were either completely or just partially not met.

Effect measures

Sensitivity analyses were only carried out on research that assessed and documented the WCs frequency in MTG compared to OG for GC. To compare OG and MTG in GC individuals' sensitivity, a subclass analysis was utilized.

Synthesis methods

A random- or fixed-effect model was utilized to generate the odds ratio (OR) and a 95% confidence interval (CI) utilizing dichotomous or continuous approaches. Between 0 and 100%, the I² index was determined. The values at 0%, 25%, 50%, and 75%, respectively, presented no, low, moderate, and high heterogeneity.⁹ Other features that show a strong degree of likeness amongst the related research were also analyzed to make sure the correct model was being utilized. The random effect was considered if I² was 50% or above; if I² was <50%, the possibility of utilizing fixed-effect rose.⁹ A subclass analysis was done by stratifying the initial estimation by the

aforementioned consequence groups. A p-value of <0.05 was utilized in the analysis to specify the statistical significance of differences between subcategories.

Reporting bias assessment

Investigations bias was measured statistically and qualitatively utilizing the Egger regression test and funnel plots that exhibit the logarithm of the ORs vs their standard errors (investigations bias was deemed present if $p \geq 0.05$).¹⁰

Certainty assessment

Two-tailed testing was utilized to investigate each p-value. The graphs and statistical evaluations were generated utilizing Reviewer Manager Version 5.3. (The Nordic Cochrane Centre, the Cochrane Collaboration, Copenhagen, Denmark).

Results

17 publications, published between 2011 and 2023, from a total of 2078 connected investigations that met the inclusion criteria were chosen and involved in the investigation.¹¹⁻²⁷ The results of these researches are presented in Table 2. 12746 individuals with GC were in the chosen investigations' starting point, 3052 of them were utilizing RG, 6603 of them were utilizing LG, and 3091 were utilizing OG. The sample size was between 47 and 4978 individuals.

Table 2. Characteristics of the selected investigations for the meta-analysis

Investigation	Country	Total	Robotic gastrectomy	Open gastrectomy	Laparoscopic gastrectomy
Caruso, 2011 ¹¹	Italy	149	29	120	
Huang, 2012 ¹²	Taiwan	664	39	586	39
Kim, 2012 ¹³	Korea	4978	436	4542	
Bo, 2013 ¹⁴	China	234		117	117
Huang, 2014 ¹⁵	Taiwan	145		72	73
Son, 2014 ¹⁶	Korea	109	51		58
Junfeng, 2014 ¹⁷	China	120		120	
You, 2015 ¹⁸	Korea	48	16	12	20
Suda, 2015 ¹⁹	Japan	526	88	438	
Procopiuc, 2016 ²⁰	Romania	47	18	29	
Shen, 2016 ²¹	China	423	93		330
Kim, 2016 ²²	Korea	375	87		288
Wang, 2016 ²³	China	296	151	145	
Parisi, 2017 ²⁴	Italy	604	151	302	151
Ojima, 2021 ²⁵	Japan	236	117		119
Caruso, 2022 ²⁶	Italy	240		120	120
Li, 2023 ²⁷	China	3552	1776		1776
	Total	12746	3052	6603	3091

No significant difference was found in SSWI between RG and OG (OR, 1.45; 95% CI, 0.89-2.35, $p=0.13$) with no heterogeneity ($I^2 = 0\%$), LG and OG (OR, 0.75; 95% CI, 0.47-1.18, $p=0.21$) with low heterogeneity ($I^2 = 33\%$), and RG and LG (OR, 1.07; 95% CI, 0.72-1.60, $p=0.73$) with no heterogeneity ($I^2 = 0\%$) in individuals with GC as shown in Figures 2-4.

The lack of data prevented stratified models from being utilized to inspect the effects of particular factors, e.g. age ethnicity, and gender, on comparison outcomes. No evidence of investigation bias was found ($p = 0.85$) utilizing the quantitative Egger regression test and the visual interpretation of the funnel plot. The majority of the implicated RCTs, though, were found to have poor procedural quality and no bias in selective reporting.

Discussion

In investigations that were considered for the meta-analysis, 12746 individuals with GC were in the chosen investigations' starting point, 3052 of them were utilizing RG, 6603 of them were utilizing LG, and 3091 were utilizing OG.¹¹⁻²⁷ No significant difference was found in SSWI between individuals utilizing RG and OG, LG and OG, and RG and LG in individuals with GC. However, care must be exercised when dealing with its values caused by the low number of nominations in the meta-analysis and the low sample size of some of the nominated investigations (2 out of 17 ≤ 100 individuals) for the meta-analysis. That would affect the level of significance of the evaluations studied.

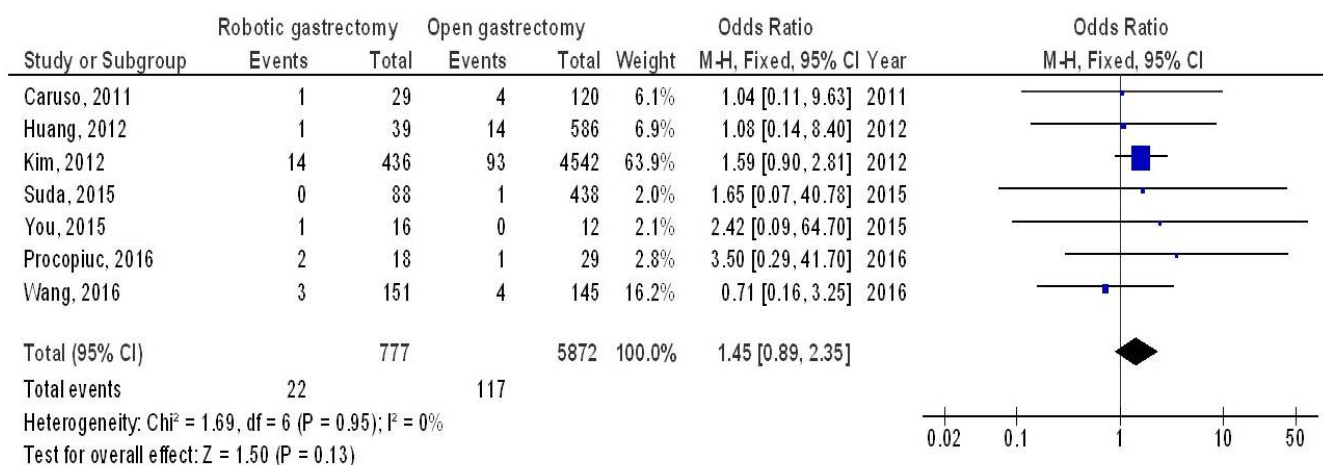


Figure 2. The effect's forest plot of the RG compared to OG on SSWI in individuals with GC

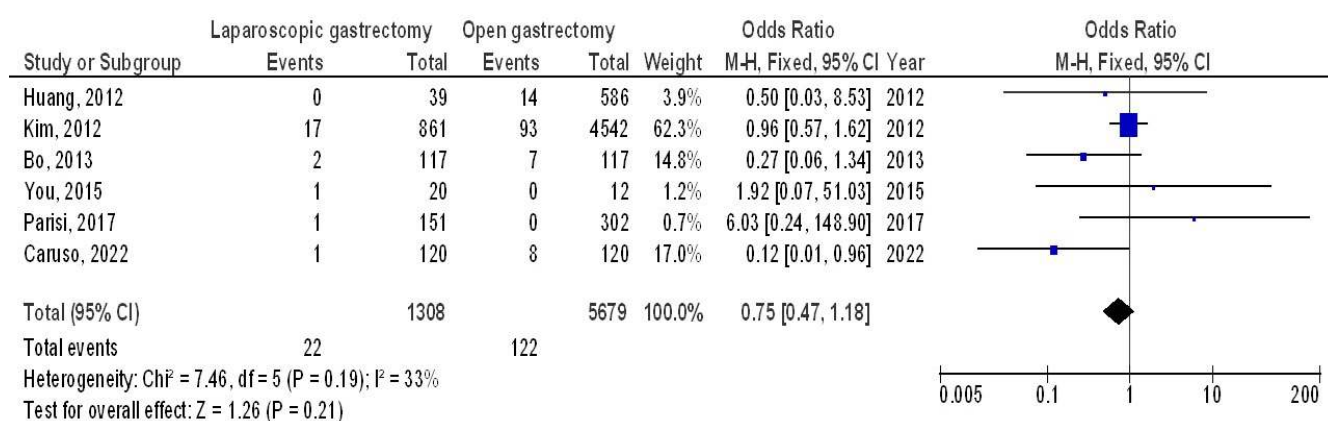


Figure 3. The effect's forest plot of the LG compared to OG on SSWI in individuals with GC

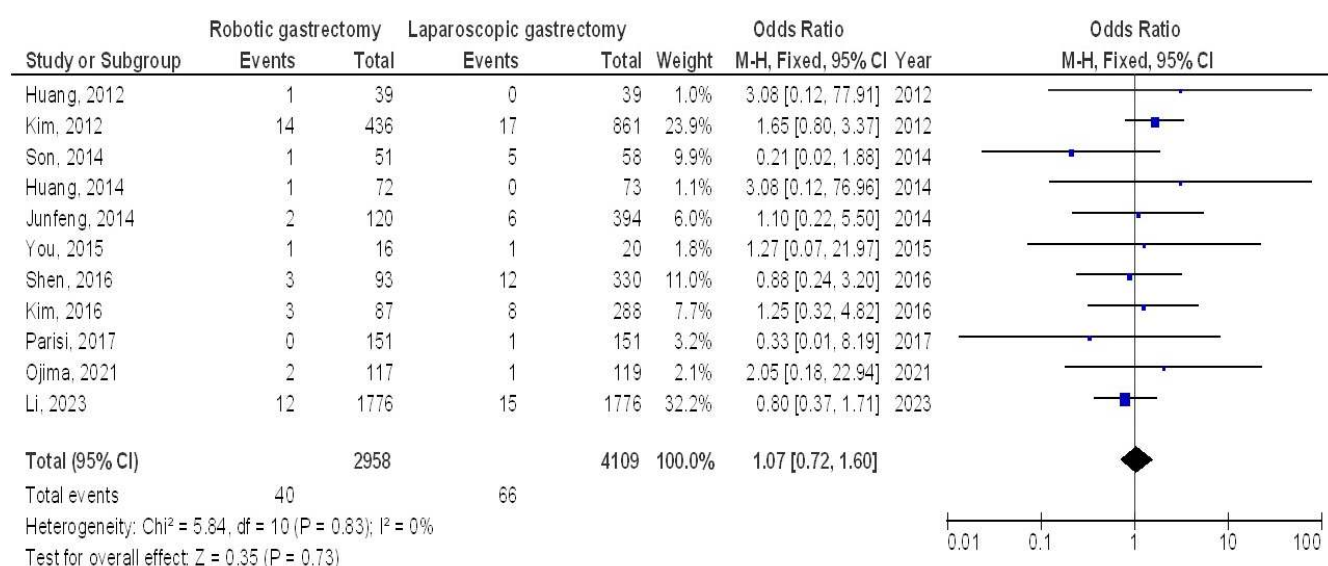


Figure 4. The effect's forest plot of the RG compared to LG on SSWI in individuals with GC

Laparoscopy and robot-assisted laparoscopy has become popular procedure among surgeons due to technological advancements in urology,²⁸ gynecology,²⁹ and general surgery.³⁰ According to numerous research, LG, and RG have been viewed as potentially workable and safe procedures. This may be related to the preparation and docking times for the LG and RG. The mean docking time for a RG was 63.3 minutes, according to a prior investigation.⁴ The docking time could be shortened by 30 minutes with RG and LG experience.¹² Another factor was that robotic gastroplasty required a learning curve to become skillful.³¹ Cases requiring robotic gastroplasty for the first time

might take longer than future cases due to less skilled execution. The length of the procedure would be dramatically shortened by experienced surgeons.³² The improved robotic tools can also shorten the duration of the operation. RG and LG can be performed precisely while causing the least amount of blood loss because of the advantages of scale motion dexterity and 3D images.³³ According to a previous investigation, the average amount of blood lost during LG and RG was 30ml.³⁴ Mortality and morbidity were positively correlated with blood loss and the requirement for transfusions.³⁵ According to investigations, reduced blood loss might lead to a lower recurrence and, as a result, might improve the quality of life for individuals with gastrointestinal disorders.³⁶ A possible decreased SSWI was expected by the lower blood loss. However, this meta-analysis did not find any significant difference between the RG, LG, and OG used. That could be due to the low number of nominated investigations for each comparison.

RG and LG are minimally invasive procedure that helps individuals experience less discomfort, a speedier return to oral intake, and less tissue damage by bypassing the lengthy abdominal incision of open surgery.³⁷ Further research into the safety of this procedure should be conducted through well-designed RCTs, and this unique approach should only be used under strict supervision. A crucial step in the MIG operation is the D2 lymphadenectomy. The node stations removal along the celiac trunk left gastric artery, and hepatic pedicle is necessary for a laparoscopic D2 gastrectomy. The D2 gastrectomy's widespread use has been constrained by its technical complexity.³⁸ RG and LG can provide careful dissection thanks to their technical advantages, even at challenging lymphatic stations near large vessels or in challenging areas.¹¹

This meta-analysis confirmed the consequence of MTG and OG on the management of GC on SSWI. More inspection is still desirable to clarify these feasible influences. This was also emphasized in former investigations that utilized a related meta-analysis procedure and originate equivalent values of the consequence.^{36, 39-41} Although the meta-analysis was incapable to discover if differences in these characteristics are related to the outcomes being researched, properly-led RCTs are vital to consider these aspects as well as the mixture of different ages, gender, and ethnicities of individuals. In conclusion, no significant difference was found in SSWI amongst RG, OG, and LG in individuals with GC.

Limitations

Since some of the investigations involved in the meta-analysis were not included, there might have been selection bias. The omitted investigations, however, did not fulfill the necessities for inclusion in the meta-analysis. Also, there was a lack of available investigations to determine whether factors like age, gender, and ethnicity influenced results. The purpose of the investigation was to measure the WCs frequency in MTG compared to OG for GC. Bias may have grown because incomplete or incorrect data from earlier research were included. Possible sources of bias involved the individuals' nutritional status in addition to their race, age, and gender. Unwantedly, incomplete data and certain unpublished work may distort the value that is being examined.

Conclusions

No significant difference was found in SSWI between RG, OG, and LG in individuals with GC. However, care must be exercised when dealing with its values caused by the low number of nominated in the meta-analysis and the low sample size of some of the nominated investigations (2 out of 17 \leq 100 individuals) for the meta-analysis.

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